

MODERN

February, 1947

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Machine Shop

TECHNOLOGY DEPARTMENT

PRIMARY ARITHMETIC

Review Problem No. 4

- 4 Hacksaws broke when 50% worn out.
 - 4 Hacksaws broke when 75% worn out.
 - 4 Hacksaws completely wore out.
- How much more cutting would have been done with 12 Hacksaws that did not break and completely wore out?

12 blades @ 100% efficiency	= 1200%
4 blades @ 50% efficiency	= 200%
4 blades @ 75%	" 300%
4 blades @ 100%	" 400%
	<hr/> 900%

$$\frac{900\%}{1200\%} = \frac{3}{4}$$

Ans. 12 blades that did not break * did $\frac{1}{3}$ more work.

** Hackmasters*

ARE UNBREAKABLE
MOLYBDENUM HIGH SPEED
STEEL HAND
BLADES

Hackmaster

Stocked by Supply Houses Everywhere

AMERICAN SAW & MFG. CO.

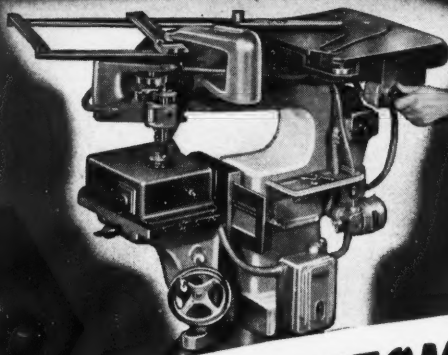
SPRINGFIELD, MASSACHUSETTS

HACKSAWS — BAND SAWS — FLAT GROUND STOCK — TOOL BITS

A Solution to

MILLING OPERATIONS

With
GORTON
and Tracer Control



THIS JOB IS COMPLETELY AUTOMATIC

This automatic milling job was accomplished with a standard Gorton Pantograph with special fixtures—milling of heavy profile turbine impeller blades.

Gorton Tracer Controlled equipment includes design centers, pantographs and electric feed for milling, engraving, cutting and many other metal operations. This equipment provides high speed, accuracy, versatility and high production characteristics for which Gorton has been known for more than fifty years. It will pay for itself. Investigate Gorton Tracer Control methods now.

Gorton Pre-Determines Results for You

Send us complete description with prints of your job. Our Engineering Department will send you a production estimate on the same job tooled on Gorton Tracer Controlled equipment—no obligation.

Send for Bulletin 1655 today!
It contains information on all
Gorton machines—what they
are... what they do... how
they do it.



FREE...

Use this handy coupon to get your copy of
Bulletin 1655 at once.

Standard Gorton Tracer Controlled 3-U
Pantograph with special fixtures pro-
files turbine impeller blades in one
completely automatic cycle

THE JOB IN BRIEF

Job: Profile turbine impeller blades.
Machine: 3-U Pantograph with
special fixtures.

Operation—Mill 30 impeller
blades in machined aluminum
alloy blank with completely
automatic feed and indexing.

Actual Cutting Time—1 minute per blade; 30 minutes per impeller.

Cutting Tools—.038" single flute cutter.
Remarks—Shape of cut determined by motorized master which
drives the tracing stylus. Feed of cutter governed by special
interlocked with indexing arrangement.



PLEASE SEND WITHOUT OBLIGATION
Bulletin No. 1655

Name.....
Company.....
Position.....
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City..... State.....

GEORGE **GORTON** MACHINE CO.
Tracer Controlled Milling



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NEW CINCINNATI DIE SINKER USES 32 TIMKEN BEARINGS

Typical of the spectacular post-war progress being made in modern machine tool development is the new Cincinnati 16" Vertical Hydro-Tel Die Sinker which has introduced some valuable production pluses into this important operation.

As shown in the photograph, the machine is duplicating a single-throw crankshaft die (left) from a master pattern (right), scanning the pattern automatically and thus relieving the operator of considerable work and responsibility during the progress of the cut.

Additional advantages stressed by the manufacturer are: saving of time in roughing out die impression because of the heavy cuts that can be taken;

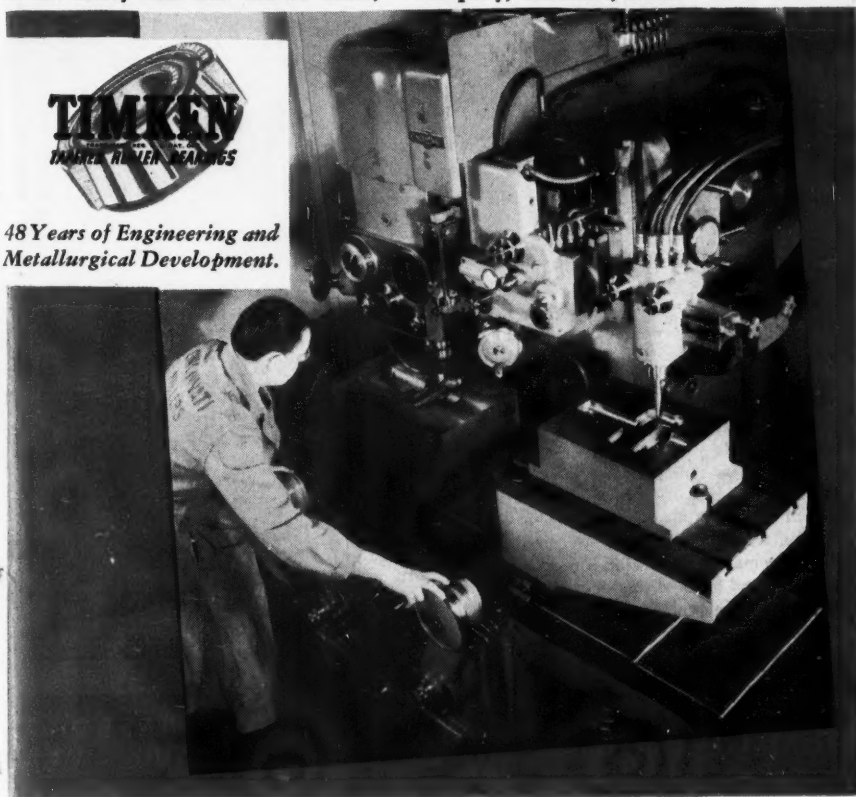
saving of time in hand finishing due to the accuracy of the machine-cut die impression.

The Cincinnati Milling Machine Company for many years has made liberal use of Timken Tapered Roller Bearings as an important aid to precision, endurance and economy. In this case 32 Timken Bearings are used to eliminate friction, reduce wear, carry radial, thrust and combined loads and hold moving parts in correct and constant alignment.

Look for the trade-mark "TIMKEN" on every tapered roller bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio.



48 Years of Engineering and Metallurgical Development.



✓ R v193 Feb-Mar 1947



THE LANDIS $\frac{3}{8}$ " THREADING MACHINE

... For Speed and Economy

Manufacturers of small parts find the $\frac{3}{8}$ " LANDIS (High Speed) Threading Machine ideal for handling their work. The high spindle speeds and simplicity of operation, with one lever controlling both the movements of the carriage and the opening of the grips, assure unusual production possibilities. The machine illustrated is producing over a thousand $\frac{5}{16}$ " diameter studs, $\frac{5}{8}$ " long, per hour. Several thousand threads are produced per grind of the chasers.



Write for Bulletin No. H-91

LANDIS MACHINE COMPANY, WAYNESBORO, PENNA., U.S.A.

THREAD CUTTING MACHINES • DIE HEADS • COLLAPSIBLE TAPS • THREAD GRINDERS

Tech

Increase production
with this
DOUBLE SLIDE
Bore-Matic

Heald No. 42 Bore-Matic provides two-way slide motion at right angles

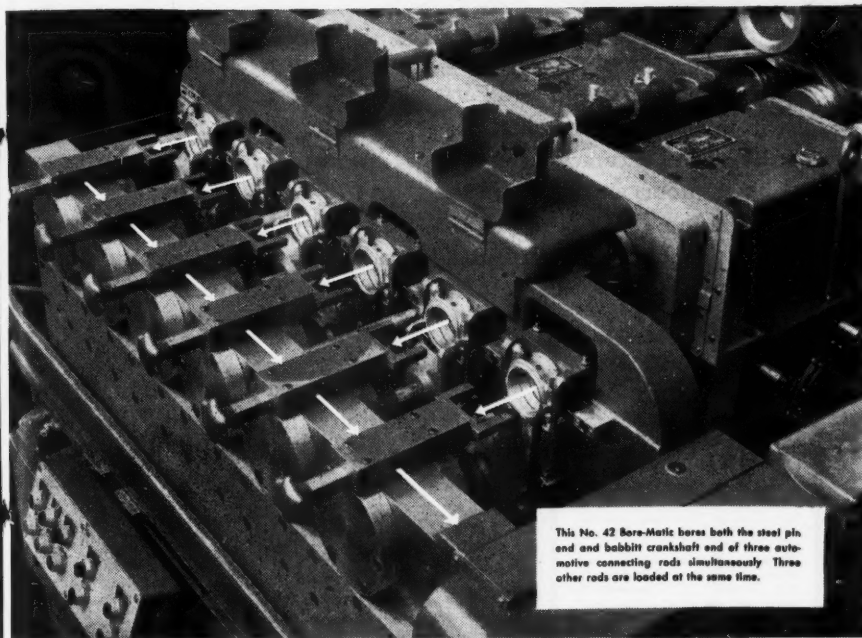
WHEN YOU'VE GOT a heavy production schedule to meet, here's the machine that can carry a double load. It's the Heald No. 42 Bore-Matic, incorporating two hydraulically-controlled slide movements at right angles.

Think how you can speed your work by combining boring, turning, plunge grooving and facing operations on this one machine—in a single automatic cycle. In addition, multiple stations substantially boost production; and simultaneous loading and boring eliminate costly handling time.

The No. 42 Bore-Matic will perform both roughing and finishing operations on a wide variety of parts, such as connecting rods, pistons, pump housings and cylinder sleeves. For further information, get in touch with the Heald branch office nearest you, or write: THE HEALD MACHINE COMPANY, Worcester 6, Mass.

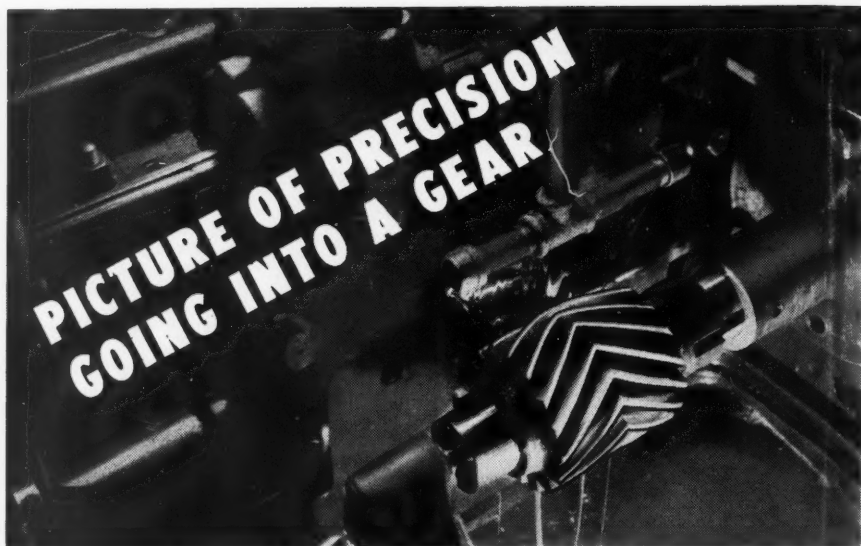
HEALD
means more precision
... less cost

Branch Offices at Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • New York



This No. 42 Bore-Matic bores both the steel pin end and babbitt crankshaft end of three automotive connecting rods simultaneously. Three other rods are loaded at the same time.

INTERNAL AND SURFACE GRINDING MACHINES • BORE-MATIC PRECISION FINISHING MACHINES



The Farrel-Sykes method of precision generation gives Farrel continuous tooth herringbone gears extreme accuracy of tooth spacing, contour, and helix angle.

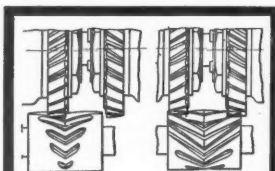
In operation, this tooth-to-tooth accuracy pays off in smooth, quiet, uniform power flow. Backlash is

reduced to a minimum and the load is distributed evenly across the entire face width.

Known throughout industry as the *Gear with a Backbone*, these gears provide extra strength and load-carrying capacity, and long, trouble-free service life.

They are available in any size up to 20 feet in diameter, for practically any application. Information and engineering assistance available, without obligation.

FB-364



The cutters of Farrel-Sykes machines reciprocate, one cutting when movement is in one direction and the other when the movement is reversed. Each ends its stroke at the center of the blank. As they cut they twist to generate the helices, and also slowly revolve in unison with the gear blank to generate the tooth contours precisely.

FARREL-BIRMINGHAM COMPANY, INC.

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MODERN Machine Shop

VOLUME 19 NUMBER 9
FEBRUARY, 1947

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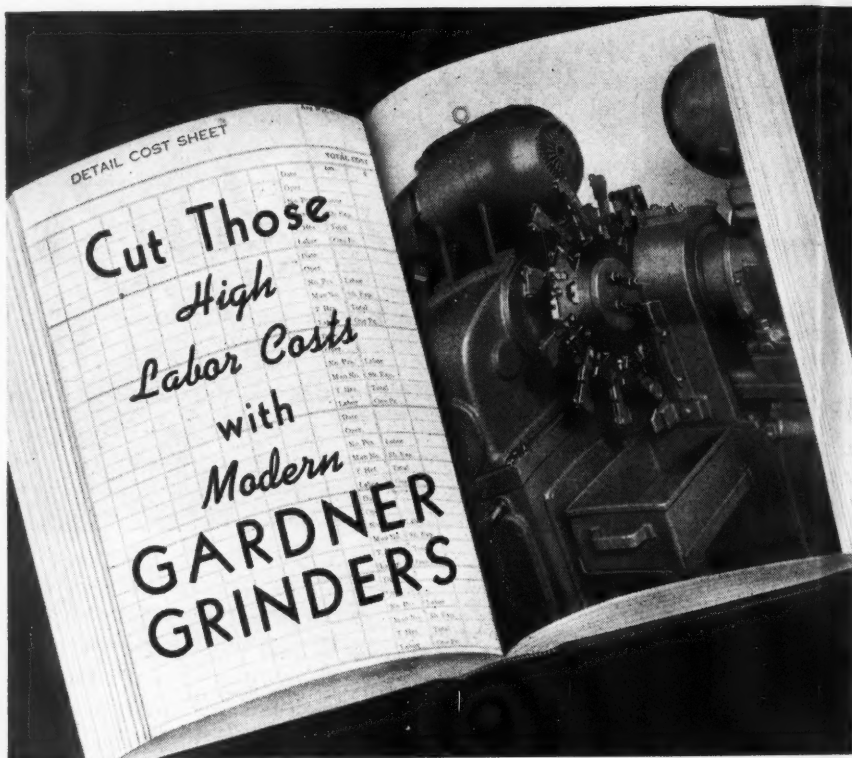


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HIGH labor costs can be cut best with high-production tools. Many production operations on flat surface jobs can be speeded up with GARDNER GRINDERS equipped with time-saving, labor-lightening, special quick-loading and unloading fixtures.

Here's an example—a Gardner No. 115-15" Double Spindle Grinder that grinds four sides of the heads of steel spring retainer buttons—TWO sides at a time. PRODUCTION: 15 to 20 cuts per minute.

TOLERANCES: .002" for parallelism; .001" for squareness; .005" for uniformity. STOCK REMOVAL: .010" to .014" overall. FEEDING: Hand load to rotary carrier; gravity unload.

Installation of Modern GARDNER GRINDERS will prove profitable because these newer, up-to-date machines enable your operators to turn out more precision-ground pieces per minute—and down come those high labor costs!

GARDNER - GRIND
YOUR Flat SURFACES

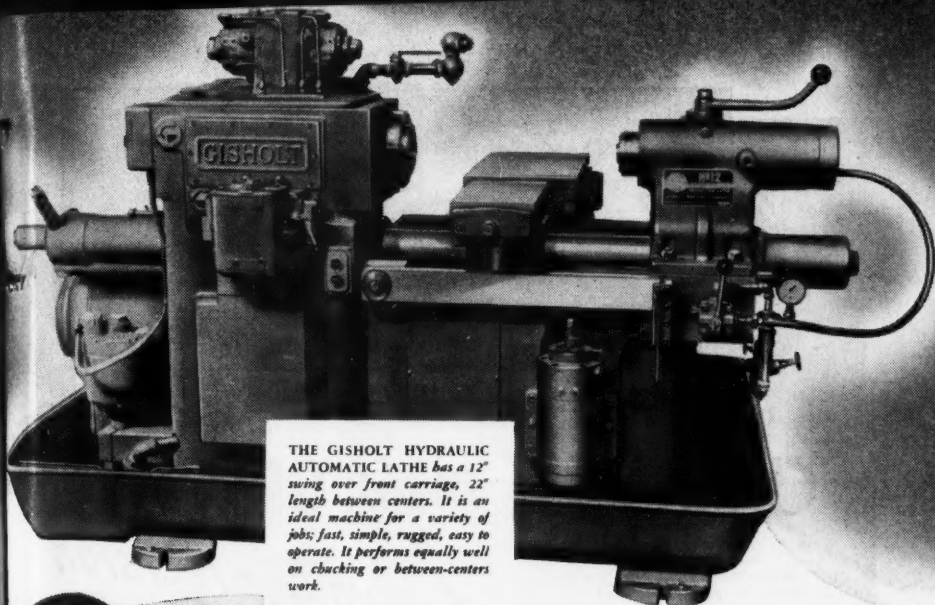
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THE GISHOLT HYDRAULIC AUTOMATIC LATHE has a 12" swing over front carriage, 22" length between centers. It is an ideal machine for a variety of jobs; fast, simple, rugged, easy to operate. It performs equally well on chucking or between-centers work.

FLEXIBILITY

in an Automatic Lathe

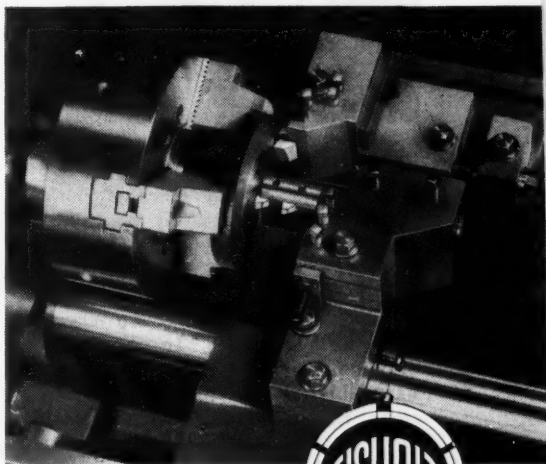
THE GISHOLT HYDRAULIC AUTOMATIC LATHE

Here, with the same basic tooling and slide arrangement, the Gisholt Hydraulic Automatic Lathe handles the machining of *three different types* of pipe flanges: threaded, Van Stone and slip-on. These flanges range from 1¼" to 2½" pipe size. The machine permits either straight or taper boring.

Such extreme flexibility is unique in a machine of this type. It is due to the ease of control and adjustment provided by the Gisholt Hydraulic Automatic Lathe. In setting up or adjusting tools, the operator has complete freedom of arrangement with regard to approach, feed, stop or return. He can do manually what is done by hydraulic pressure during the cycle of the machine.

Flexibility is only one of many outstanding features of this modern automatic lathe. If you have parts to produce in volume, why not learn about all of them? Learn what it can do to maintain accuracy at high speeds and cut your costs.

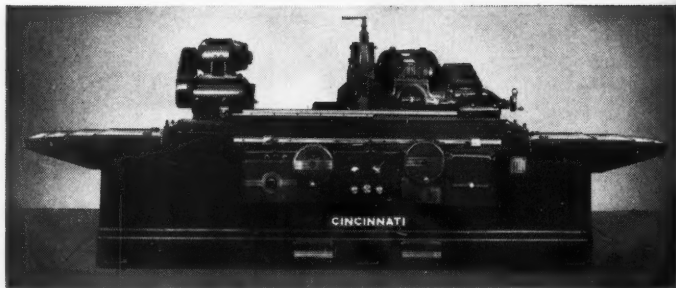
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... with Gisholt**



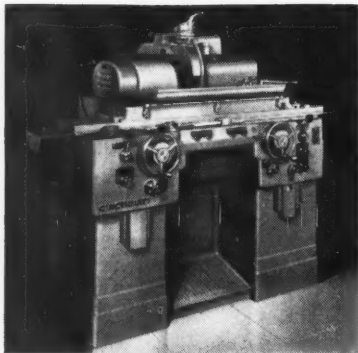
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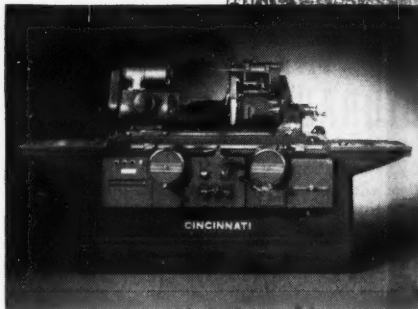
CINCINNATI FILMATIC 10" Plain Hydraulic Grinding Machine. Also available in 14"-L size. Between-center lengths, 18", 36", 48", 72" and 96". Catalogs G-490-2 and G-533-1.

CINCINNATI GRINDERS..

CINCINNATI FILMATIC 4" Plain Hydraulic Grinding Machine. Built in 12" and 18" lengths. Catalog G-551.



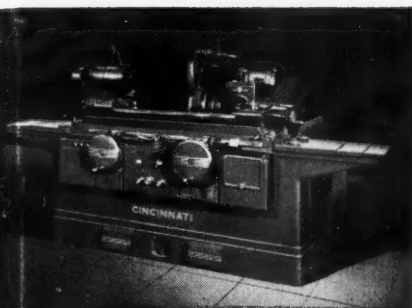
*for your precision
cylindrical
grinding operations*



CINCINNATI FILMATIC 12" Hydraulic Universal Grinding Machine. Also available in 14", 16" and 18" sizes, and between-center lengths 36", 48" and 72". Catalogs G-486-4 and G-474-3.

● Industrial sewing machine parts are precision ground on CINCINNATI FILMATIC 4" Plain Hydraulic Grinders ... 54" back-up rolls for rolling mills are ground to a mirror finish on CINCINNATI FILMATIC Traveling Wheel-head Roll Grinders. In centerless grinding, the parts ground on CINCINNATI FILMATICS range from balance shafts for clocks to bowling balls. There's a CINCINNATI FILMATIC Grinder for almost any size part you might mention. Principal types are shown

here. Brief descriptions of most of these machines will be found in general catalog M-1420-1.



CINCINNATI FILMATIC No. 1 Centerless Grinding Machine. Capacity up to 16" diameter. Catalog G-537.



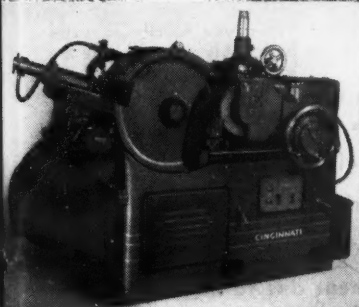
CINCINNATI FILMATIC No. 4 Centerless Grinding Machine. Capacity up to 9" diameter. Catalog G-538.



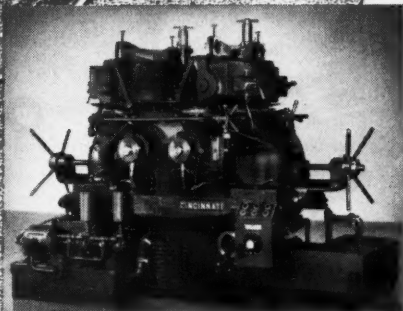
CINCINNATI FILMATIC No. 2 Centerless Grinding Machine. Capacity 1 1/2" to 4" diameter. Catalog G-456-4.



CINCINNATI FILMATIC 14" Plain Self-Contained Grinding Machine. Also available in 16" size and various center lengths from 56" to 168". Catalog G-491-2.



CINCINNATI FILMATIC No. 3 Centerless Grinding Machine. Capacity up to 4" diameter. Catalog G-438-3.



CINCINNATI FILMATIC Centerless Lapping Machine. Capacity 1/4" to 3" diameter.

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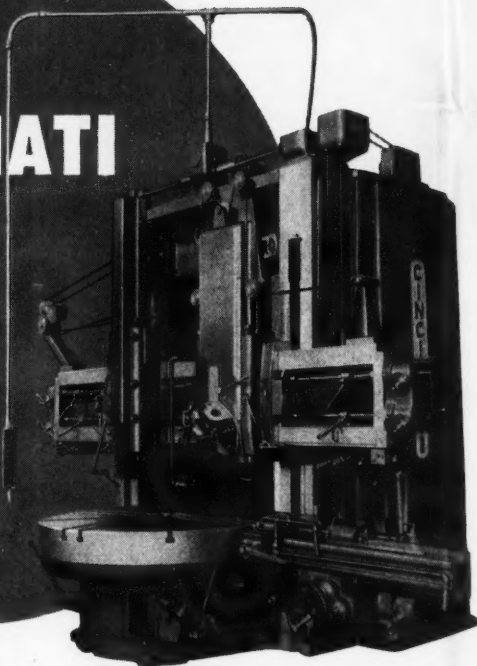
CINCINNATI 9, OHIO, U. S. A.

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*Table mounted on large center
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bearing and large diameter
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gives you an anti-friction
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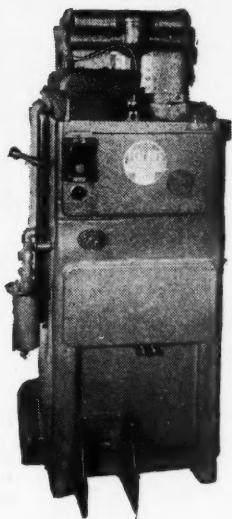
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Extra precision and quieter operation are the standout selling features of gears cut on this machine. Typical Fellows versatility places this Gear Shaper in a class by itself. A descriptive circular is yours for the asking.



Fellows 3-inch Fine-Pitch
Gear Shaper

Fellows

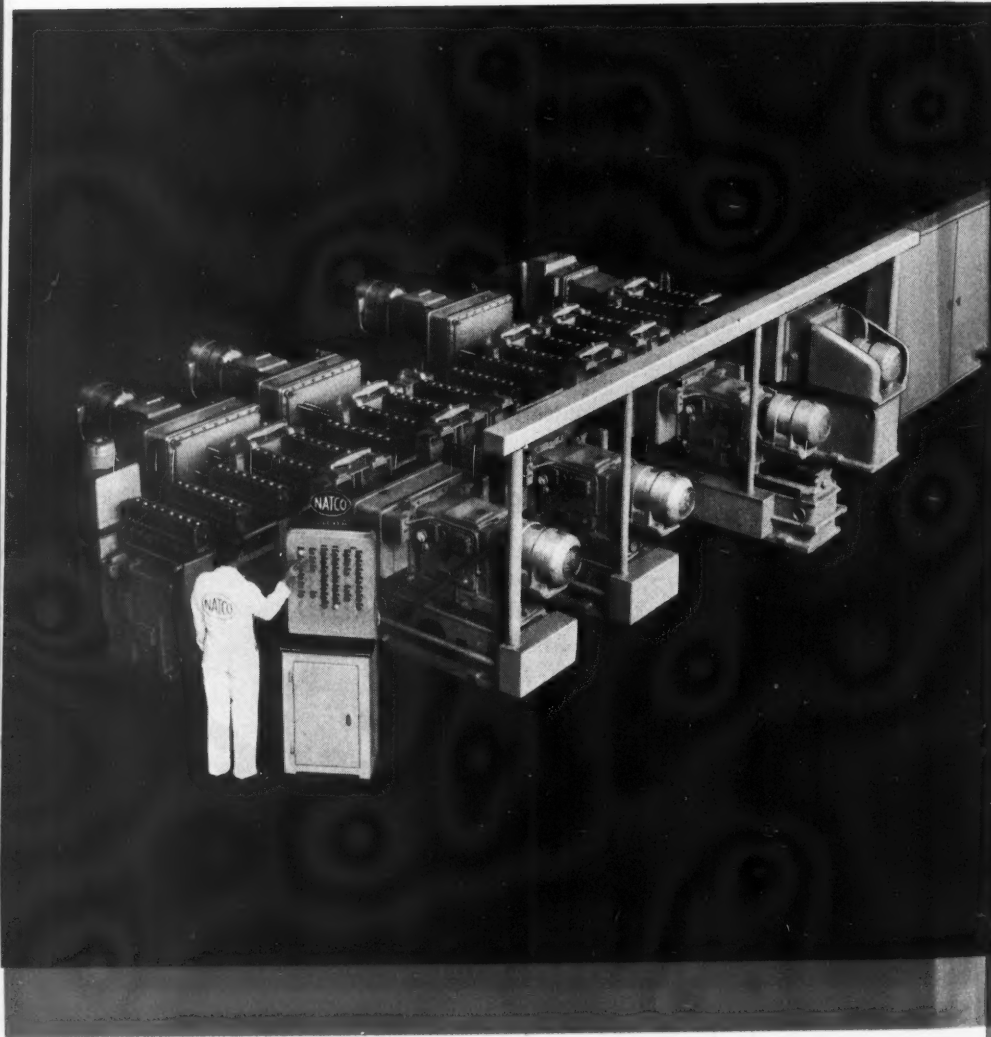
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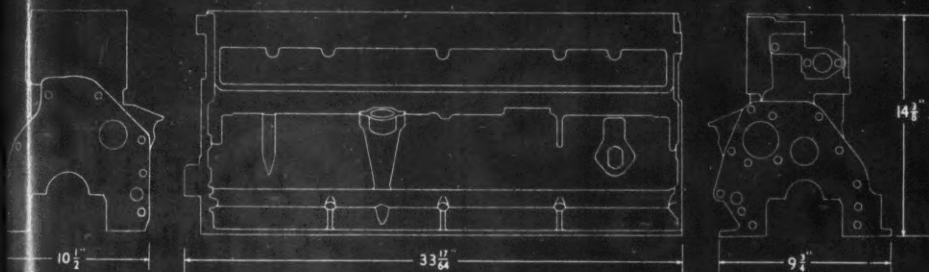
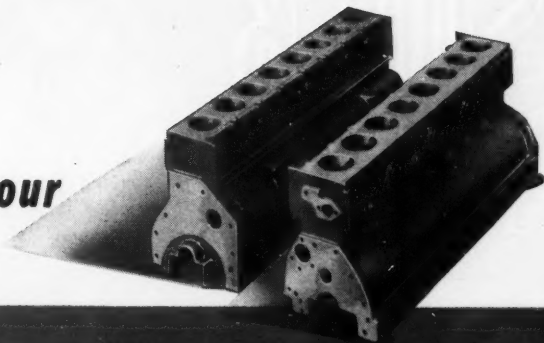
NAT

Build

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ing Machine

ine blocks per hour



The NATCO HOLEWAY Processing Machine illustrated at the left produces 90 engine blocks per hour with only one operator. It automatically advances the engine blocks from station to station, clamps and unclamps them in each position, and synchronously performs the operations at all stations as the blocks travel through the HOLEWAY Machine. The blocks are then automatically ejected onto a roller conveyor at the completion of all operations.

The NATCO HOLEWAY Machine illustrated here involves 19 stations and is arranged to complete the following operations: drills 23 holes ranging from 3/16" to 1/2"; combination drills and countersinks one 7/16" hole; countersinks 14 holes ranging from 3/16" to 1/2"; taps 15 holes ranging from 3/8" to 7/16" tap; drills 19/32" diameter oil gallery hole clear through engine block in 12 successive steps; taps oil gallery both ends 3/8" pipe tap.

Join the trend to automatic handling...

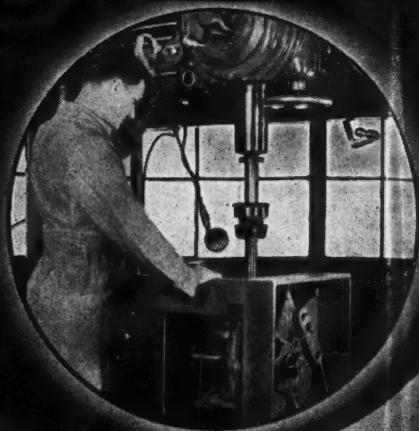
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How NATCO automatic Processing Machines speed productive capacities of both machine and operator is described by actual case studies in a 28-page circular. It will pay you to write for one of these illustrated circulars to see how you can improve your automatic handling methods. Specify NATCO Machine Circular No. 145-MS.

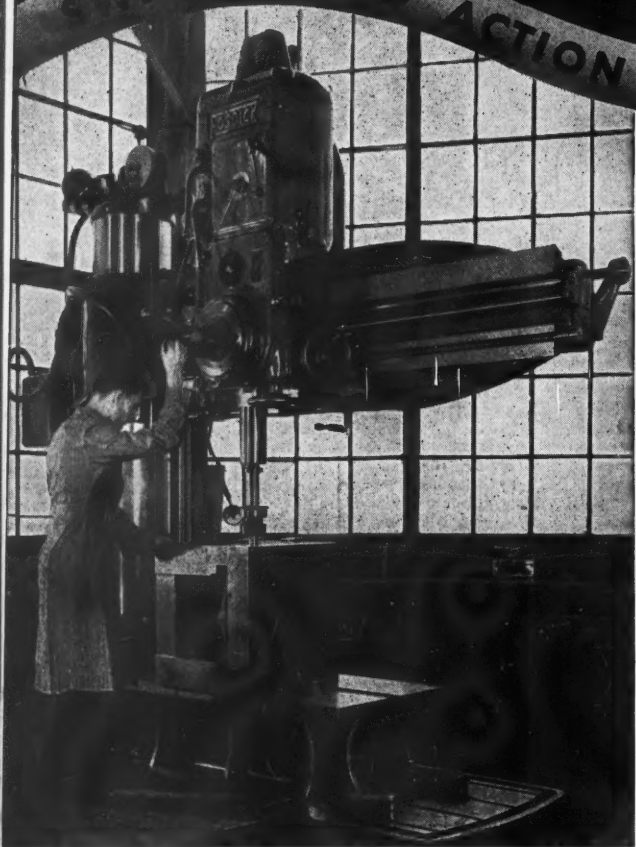


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The part being drilled is only one of many parts of various Ex-Cell-O machines that are drilled, tapped or bored on the sturdy, time and labor saving FOSDICK RADIAL DRILL.

A box jig holds the work while drilling, reaming or tapping various diameter holes from two or more sides.

Note the convenience and time-saving features of centralized control in the head. A wide range of feed and speed changes, as well as hand feed, are instantly available.

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Ask for the well-illustrated, fully descriptive folder on JARVIS TORQOMATICS. It shows you how to increase quality production at lower cost. WRITE TODAY, Dept. 323, Jarvis Power Tools, Middletown, Connecticut.

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DRILLS**



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7. Tools and chips actually stay cool to touch.

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- Cools faster—allows faster cutting.
- Uniform temperature increases accuracy.
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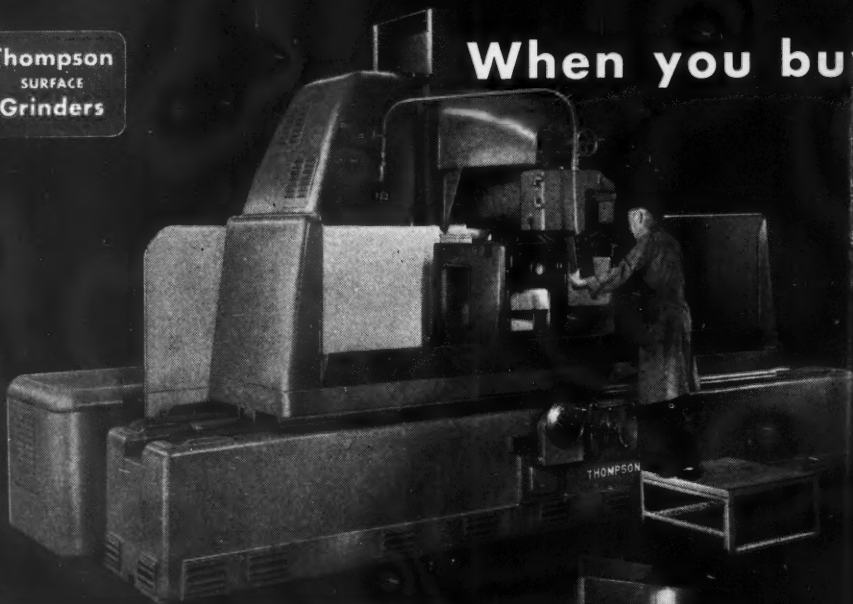
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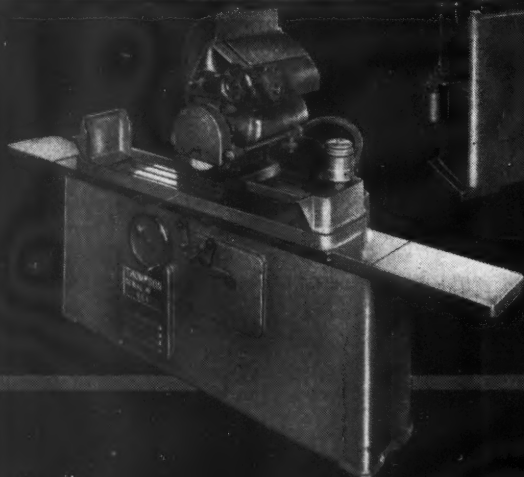
Thompson
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When you buy . . .



TYPE C—Large capacity, heavy duty, precision surface grinders for work 12" to 36" wide, 16" to 48" high, and 40" to 240" long. Cutting feed range of 10 feet to 100 feet per minute. Automatic hydraulic feeds to head and table.

TYPE B—A sturdy, extremely accurate, heavy duty tool room grinder, built for many years of dependable accuracy. Both hand and hydraulic feeds are available. Made in sizes 6" x 12" x 18" to 12" x 12" x 60". Also a line of heavy duty die grinders, identified as type "BB".

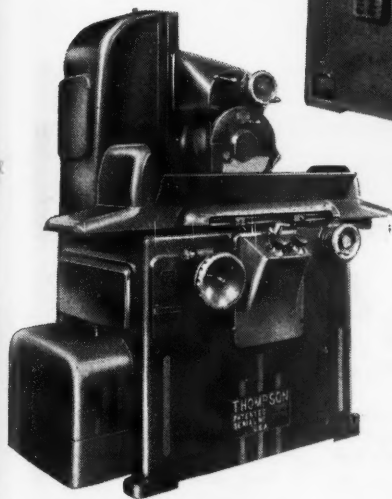
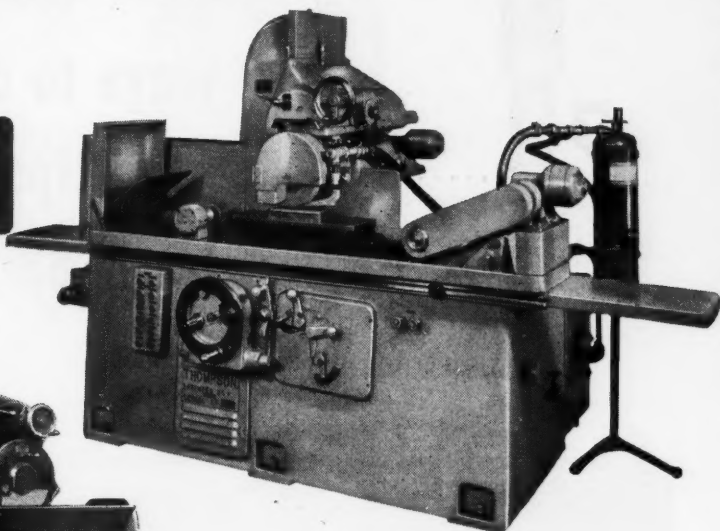


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There's a Thompson for Grinding
every Flat Surface or Contour



TRUFORM GRINDERS (Crushed Wheel Form Grinding) — Thompson Truforming Grinders are completely engineered units with *two* crushing rolls permitting practical production of precision flat form contours for the first time. Standard machines for forms up to 6" width available.



TYPE F — A sensitive, high speed tool room and production surface grinder. Hand and hydraulic feeds to head and table. Precision table ways; double length box bed; 6" x 10" x 18".

Before You Buy

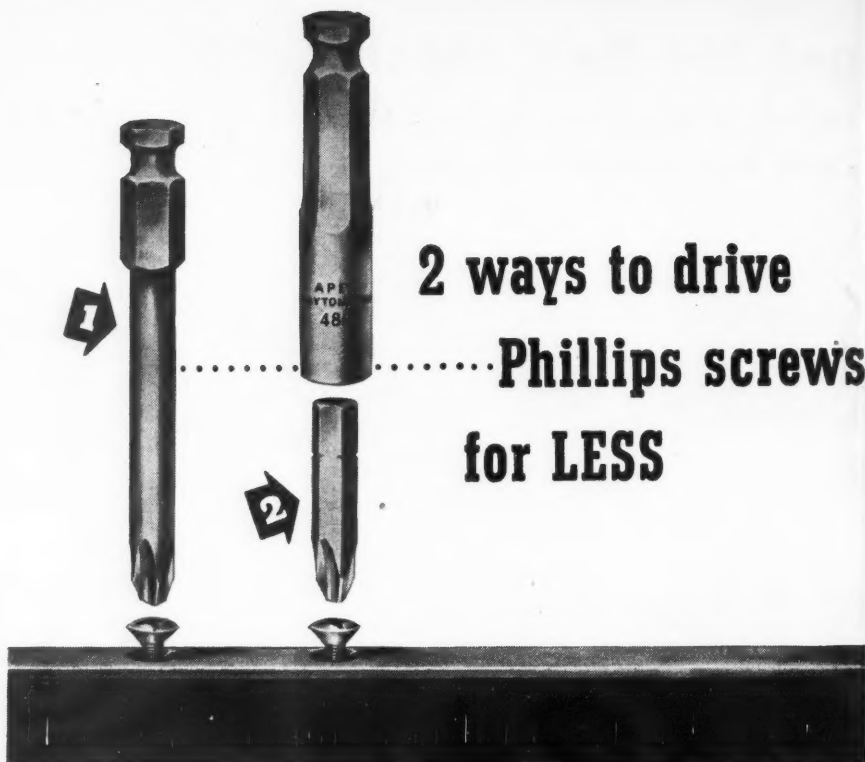
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SPRINGFIELD, OHIO

Thompson
SURFACE
Grinders

Copyright 1947—The Thompson Grinder Co., Inc.



... and they're both BEST!

1. Best for driving Phillips screws in close quarters, when you need a bit of minimum diameter. By returning worn bits to Apex for complete reconditioning, you can multiply service life many times — actually get eight lives per inch of bit. The cost: a fraction of the price of new bits.

Shanks: for all your electric, pneumatic, or spiral drivers.

2. Best for driving screws where space permits the slightly larger OD of the Apex exclusive bit holder, with the replaceable insert tip. Once you get holders for your drivers, it's a cinch to stock four sizes of tips to fit

practically all your bit holders and drive the full range of Phillips screw sizes. Tips float in holders, seat more easily in screw recesses, simplify bit inventory, give maximum service.

Write today for Catalog 15 on Apex standard power bits and Bulletin 102 on Apex insert type bits.

The Apex Machine & Tool Co., 1028 S. Patterson Blvd., Dayton 2, Ohio

APEX

screwdriver bits

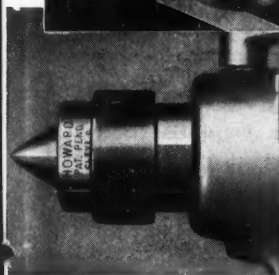
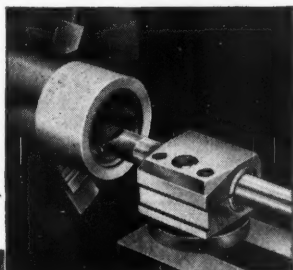
Safety Friction Tapping Chucks • Quick Change and Positive Drive Drill Chucks • Vertical Float Tapping Chucks • Parallel Floating Tool Holders • Power Bits for Phillips, Slotted Head and Clutch Head Screw Drivers • Hand Drivers for Phillips and Clutch Head Screws • Aircraft and Industrial Universal Joints • Sockets and Universal Joint Socket Wrenches.



What's a gas light got to
do with tool holders?

Just this
once upon a time gas lights were
considered good . . . old-fashioned
tool holders were good, too . . .
till operators used the

HOWARD *Method of* SUPPORT



HOWARD TOOL HOLDERS

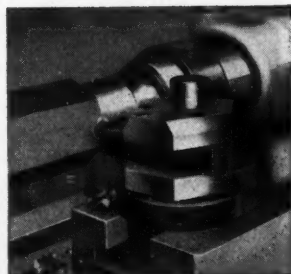
- Height adjustment ring • Rigidity—accuracy—versatility • All sizes and models for bench lathes to roll lathes

HOWARD LIVE CENTERS

- Back up ring for rigidity • Thrust spring for high loads • Reground or reconditioned for nominal charge • Pre-loaded and ground for accuracy

HOWARD COMBINATION

- HOLDERS for boring and cutting off • Rigid height adjustment • Full length bar and blade clamp • Holders in 6 sizes

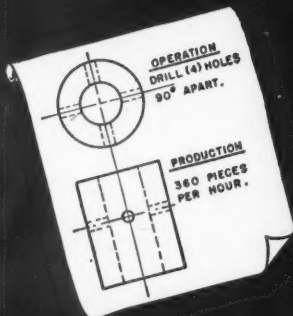


Write for the
HOWARD
Method of
SUPPORT

HOWARD DEARBORN, Inc.
3370 West 140th Street, Cleveland 11, Ohio

Avey Automatic METHOD No. 2

By Invitation Member



THE *Avey* CAM FEED UNIT

No. 1 Size— $\frac{1}{2}$ " capacity in cast iron.

No. 2 Size— $\frac{7}{8}$ " capacity in cast iron.

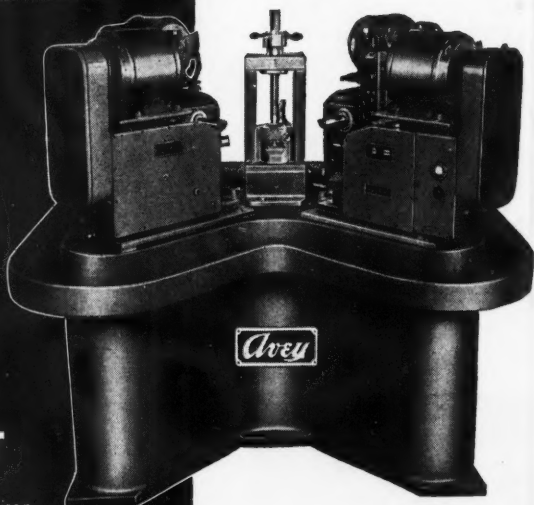
designed for multiple
directional drilling,
reaming, boring or
tapping (high production)
at one stationary
clamping of work

THE AVEY DRILLING MACHINE CO.
CINCINNATI • OHIO • U. S. A.



Avey

DRILLING
MACHINES

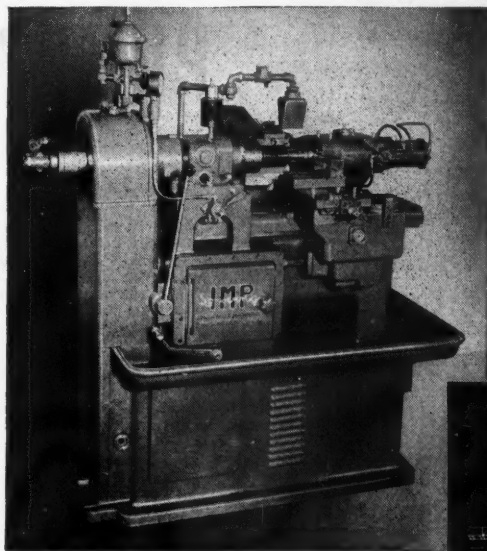


The AVEY Cam Feed Unit (Avey Automatic Method No. 2) — high production at low labor cost — The enabling of semi-skilled operators to deliver High Quality Production: Speedily, Accurately, Efficiently, and with a minimum of supervision.

Send for Engineering
Bulletin 645

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



ROTOR AND STARTER COMMUTATORS

Automatically MACHINED

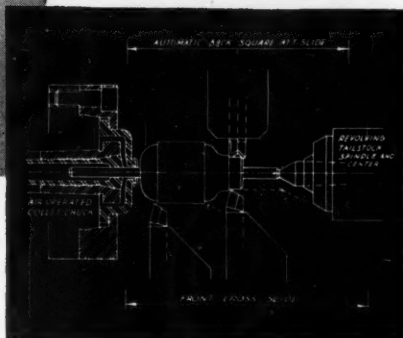
TO HIGH ACCURACY
AND FINISH ON

Lo-swing IMP

PROBLEM: To automatically turn, chamfer and face electric motor rotor and starter commutators, maintaining a fine finish and extremely close tolerances.

SOLUTION: The Lo-swing IMP Lathe with special equipment was selected for this job primarily because of inherent design features which permit high spindle speeds and unusual turning accuracy.

The work is held and driven from one of the ball-bearing seats of the shaft with an air-operated collet chuck. The tailstock end is supported on a revolving center, the movement of which is actuated by an air cylinder. This method of holding and driving the rotor



assures the close concentricity which is required between the bearing seats and the O. D. of the commutator. The operation consists of turning the O. D. of the commutator and rotor, the facing of the shoulder (which is part of the commutator) and the chamfering of the shoulder.

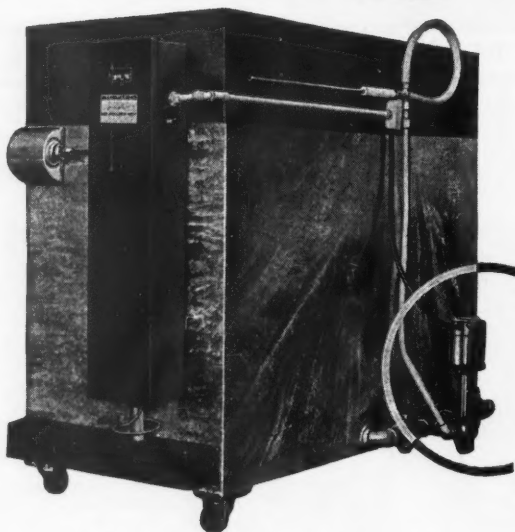
Several other Lo-swing set-ups have been developed for this type of work. We suggest you send in your prints for our estimate.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

LATHE NEWS from SENECA FALLS

What do You want in a...

COOLANT PUMP?



Illustrated above is an installation of a *Ruthman Model 4-P3 Long* on a *Phillips All Electric Vapor Degreaser Model 60*. On this installation the *Gusher Pump* performs three pumping operations from a central solvent sump which is divided into a clean and dirty solvent sump. The *Gusher Pump* furnishes clean solvent to the flushing spray hose—pumps clean solvent from the clean solvent sump to the boiling sump—and also pumps out both sumps to drain the machine for cleaning.

RUTHMAN GUSHER COOLANT PUMPS

This is another example of the versatility of *Ruthman Gusher Coolant Pumps*. Our long experience in designing and manufacturing pumps assures you of the correct design to meet your requirements efficiently and economically.

We will be glad to advise you on your requirements both in a standard model pump or a pump for specialized requirements.

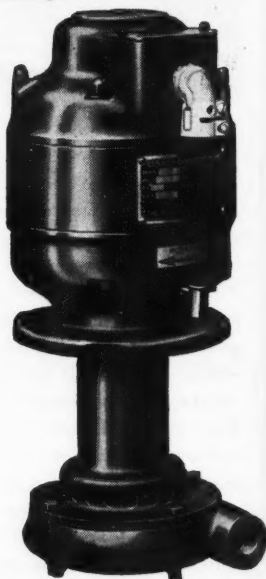
Write for Catalog 10F

THE RUTHMAN MACHINERY CO.



1809 READING ROAD

CINCINNATI 2, OHIO



**SMALLER
THAN A**

Thumbnail



PHOTOGRAPH Courtesy Westinghouse Electric Corporation

CHECKING a thread gage smaller than a thumbnail is simple when a Jones & Lamson Optical Comparator is used. The enlarged shadow of the gage projected upon the screen allows its contours to be examined for absolute accuracy, quickly and easily.

Jones & Lamson Optical Comparators provide a rapid and extremely accurate

method for inspecting even the most complex forms.

Our engineers are inspection specialists, their knowledge of holding fixtures, handling methods and suitable. Comparator equipment has saved thousands of dollars in manufacturing plants throughout the country. Call, write or wire for their service today.



Probably a Jones & Lamson Optical Comparator could effect comparable savings for you. Write for our book, "Beyond a Shadow of a Doubt." Or, better still, ask for one of our inspection engineers to call and discuss your inspection problems.



THAT JONES & LAMSON
OPTICAL COMPARATORS ARE
USED TO INSPECT SUCH
COMPLEX SHAPES

JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U.S.A.



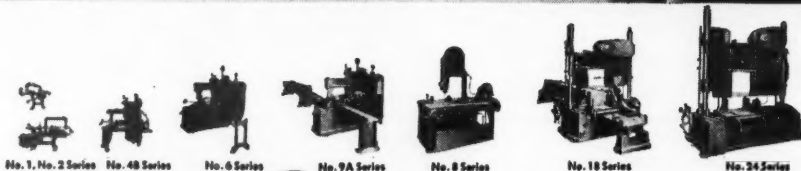
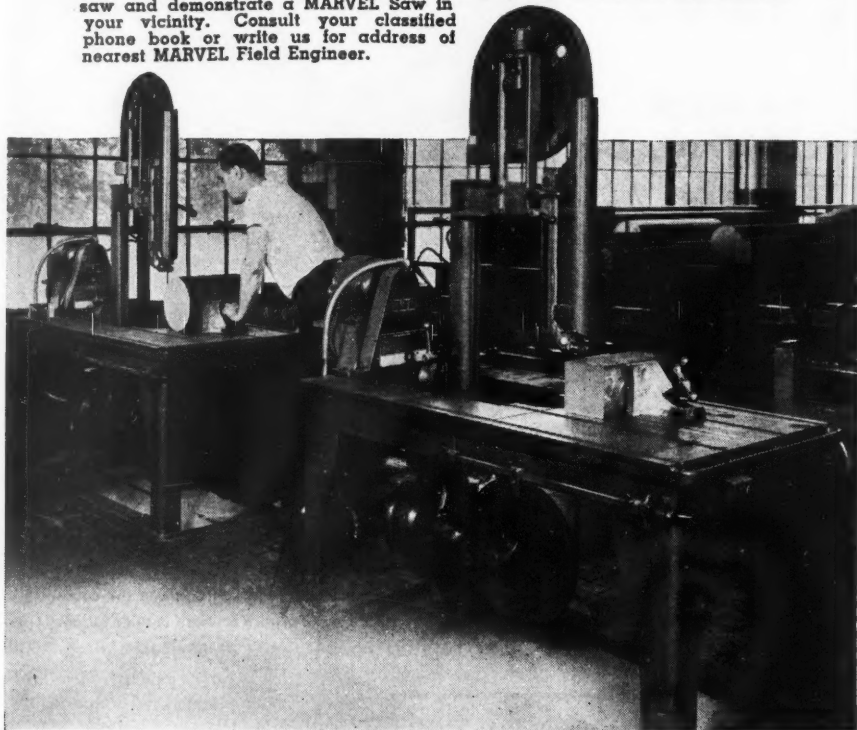
Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers • Ground Thread Flat Rolling Dies

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MARVEL No. 8 Band Saws are used

Not only in all Latrobe warehouses but at the mill too, MARVEL No. 8 metal-cutting Band Saws are used to cut expensive Tool and Alloy Steels accurately to specification. There are many reasons why the Latrobe Electric Steel Co. has standardized on the universal MARVEL No. 8. It is the most universal saw built — will cut the smallest pieces as well as the largest work up to 18" x 18" with equal accuracy, will cut at any angle, etc. . . . and, is easily operated and practically trouble-proof.

There is a MARVEL Saw for every need and budget. A local MARVEL Field Engineer will gladly discuss your problem with you, recommend the most suitable saw and demonstrate a MARVEL Saw in your vicinity. Consult your classified phone book or write us for address of nearest MARVEL Field Engineer.



MARVEL SAWS

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

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Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

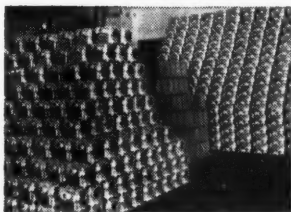
• MILLIONTHS OF AN INCH FOR SALE •



Don't Drive Your Production Manager Nuts!

The failure of close tolerance parts to assemble correctly, resulting in scrap, reworking and vanishing profits is a nightmare. We, at VINCO, have a sure cure for such a malady—**'PRECISION WISDOM'**. **'PRECISION WISDOM'**, the result of more than twenty-five years of close tolerance experience, means VINCO can

economically mass produce, for you, complicated parts and assemblies having "tenth" tolerances and micro-inch surface finishes. Call on VINCO to handle your next precision production job and learn what **'PRECISION WISDOM'** can do for you. We are as close as your telephone.



Mass Production of machined parts, such as those shown at the left, is done in Plant 2. Here parts, having wider tolerances than those above, are handled by skilled workmen operating modern equipment. Thousands of pieces leave Plant 2 daily on their way to our satisfied customers. Why don't you try VINCO Service at your earliest opportunity?

VINCO CORPORATION
8855 Schaefer Hwy. • Detroit 27, Michigan





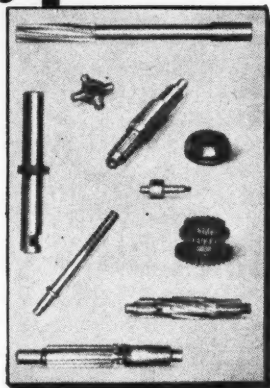
THE FITCHBURG METHOD OFFERS SPECIAL MACHINES FROM STANDARD UNITS

Fitchburg automatic multiple precision grinding offers the same profit possibilities that up-to-date shops now earn with multiple tooling and combined cutting on machined work.

Special machines mounting Standard Bowgage Head Grinding Wheel units, like the one illustrated, enable the precision grinding of two or more dimensions at a single handling. Grinding is completed within the time required for the longest single operation. On mass production work these Fitchburg grinders rapidly repay their cost.

On hundreds of parts like those shown, for machine, automotive or ordnance work, Fitchburg engineers can help you to make sure your orders are filled on time, and at the lowest possible cost. It will not obligate you to mail in your blueprints for study. Catalog shows wide range of other successful applications. Write for a copy today on your business letterhead.

When installing special grinding equipment it is important to remember that the Fitchburg Bowgage Grinding Wheelhead is a self-contained standard unit. It can be remounted on standard machines, or on new special bases, for operations other than the one originally specified. This feature protects your investment.



This book shows how
to cut grinding costs...
Sent free...write for
it today.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of—Bowgage Wheelhead Unit, Multiple Precision Grinding Unit, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

Get **SMOOTH SURFACES**
for
Accurate Layout Work



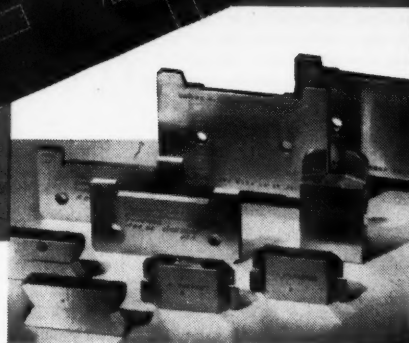
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FLAT GROUND STOCK

MAKE YOUR OWN GAUGES, dies, jigs, templates, stamps, shims, machine parts and small tools... with Simonds Oil Hardening Flat Stock, made of Simonds own alloy tool steel, uniformly annealed for easy machining and proper hardening.

SAVE TIME AND MONEY with this Flat Stock which is cut to 18" length and accurately ground to standard thicknesses and widths. *No need for the expensive machining required to grind ordinary stock to size.*

145 STOCK SIZES . . . special sizes to order. Get "Red Streak" Flat Ground Stock from your Simonds distributor, or the nearest Simonds office. Immediate delivery from stock on most sizes.



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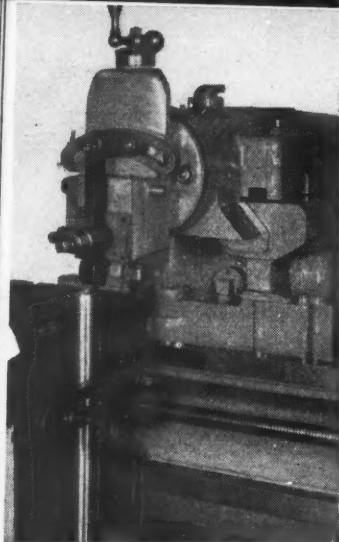
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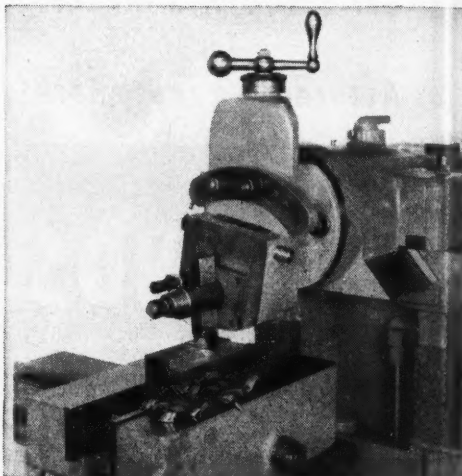
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BRANCH OFFICES: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 311 S. W. First Avenue, Portland 4, Ore.; 31 W. Trent Ave., Spokane 8, Wash. **Canadian Factory:** 593 St. Remi St., Montreal 30, Que.

Watch a Champion



SHORT STROKE . . . slotting keyway in end of shaft. Extremely short cutting and return strokes may be set at high speeds . . . without causing vibration or affecting smoothness of cut. Adjustment for any speed or stroke length is made quickly and easily by a simple setting of stroke adjustment levers . . . an important advantage in small lot production.



ROUGHING CUT . . . note size of chips. Rugged construction and abundant power make heavy-duty work an "every-day job" for a Rockford Hy-Draulic Shaper. Hy-Draulic design is also a safeguard against excessive feed and resultant overloading. The hydraulic system provides a pre-determined maximum pressure, ample for every type of job; when an unsafe overload is met, ram will stop, as oil by-passes.



can you compete . . . ?

Why not make sure of your shaper equipment now. Ask yourself, could you compete with the work turned out on a new Rockford Hy-Draulic. Compare the work turned out on your present equipment with that of a champion in terms of cost, accuracy, operating ease or speed. Rockford Hy-Draulic Shapers give you accurate, infinite control of stroke and feed. They also give operating advantages that only Hy-Draulic design can provide. Put a Rockford Hy-Draulic Shaper through its paces and watch it perform on every type of shaper job. Write for Shaper Bulletin 442.



**ROCKFORD MACHINE TOOL CO.
ROCKFORD ILLINOIS**

4701

Hy-Draulic



SHAPER



SHAPER



SHAPER



SHAPER



SHAPER

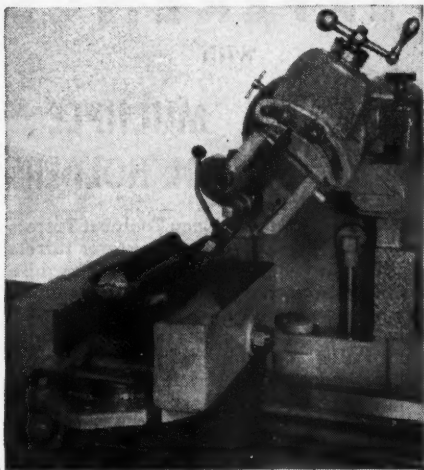


SHAPER

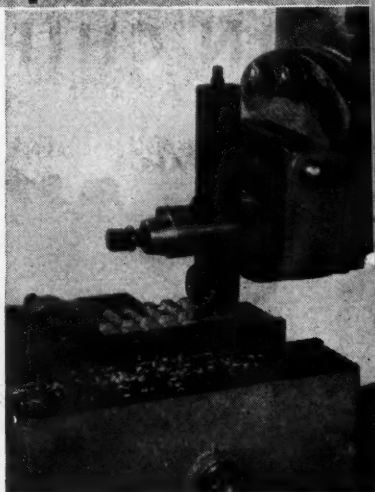


SHAPER

n... go through her paces



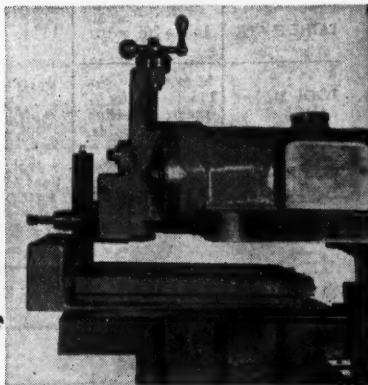
ANGLE CUT . . . cutting a dovetail on a slide. Precision of Rockford Hy-Draulic Shaper construction assures work accuracy and fine surface finish.



INTERMITTENT CUTTING . . . cushioning effect of hydraulic system makes interrupted cutting an easy operation for both tool and machine. Eliminates shock as tool enters each cut . . . protects tool against rapid wear and breakage.



CUTTING TO A LINE . . . cutting keyway up to a drilled hole. As in the preceding illustration, this work set-up is an example of the accuracy in stroke length maintained by the new Rockford Hy-Draulic Shapers.



CUTTING TO A SHOULDER . . . this illustrates ability of shaper to maintain stroke length exactly. Whatever the stroke length or speed, it can be demonstrated that the new Rockford Hy-Draulic Shapers will cut-to-a-line with an accuracy far greater than required by any conventional shaper set-up.

28"

36" OPENSIDE

PLANERS

SLOTTERS

SHAPER-PLANERS

Hy-Draulic

PER

SHAPER

ON CHIP INTERFERENCE

with

Enco MULTIPLE TOOL HOLDERS



Model 6-S

The built-in accuracy of Enco Toolpost Turrets is constantly safeguarded. On larger turrets and all heavy duty models, which require extra protection, chip interference is avoided. Compensating spring makes indexing easier and keeps clamping lever and tool block in contact while block is indexed. Chips cannot enter the indexing mechanism . . . (precise indexing is assured. Piece after piece can be produced with full precision required by the job — without switching tools. Enco's hardened all-steel construction protects original accuracy.

Do you use carbide tipped tools? Ask us about greater rigidity?

"A" dimension range (From diagram on this page)	MODEL 6-S* 1 1/2 to 2 7/8" incl.	MODEL 4 1/2-S* 1 1/8 to 2 1/2" incl.	MODEL 3 1/2-S 1 1/8 to 1 3/4" incl.	MODEL 2 1/2-S 7/8 to 1 5/8" incl.	MODEL H 7/8 to 1 5/8" incl.
LATHE SWING	14" to 20" swing	13" to 16" swing	10" to 13" SWING AND BENCH LATHES	BENCH LATHES	BENCH LATHES
TOOL SIZE RANGE	3/8 to 1 1/4" or No. 2 toolholder for 3/4" square bit—High speed or carbide.	3/8" to 3/4" swing	1/4" to 1/2"	1/4" to 3/8" incl.	1/4" to 3/8" incl.
SPECIFICATIONS	4 tool, 12 positions 6" square PRICE \$99.00	4 tool, 12 positions 4 1/2" square PRICE \$49.50	4 tool, 12 positions 3 1/2" square PRICE \$35.00	4 tool, 12 positions 2 1/2" square PRICE \$23.00	6 tool, 12 positions 2 3/4" hex. PRICE \$25.00

*Equipped with compensating spring—not required on smaller turrets.



Made of Lathe end. Size	A	B	C	D	E	Maximum tool also desired

Write for "30 MODELS" catalog.

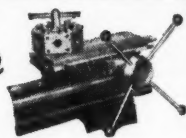
Prompt delivery can be made on all Enco Lathe Turrets. When ordering, give all dimensions and tool sizes.

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HEXTURRETS

— the better bed turret!



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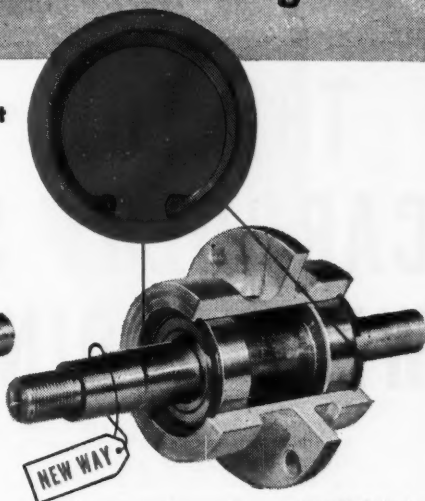
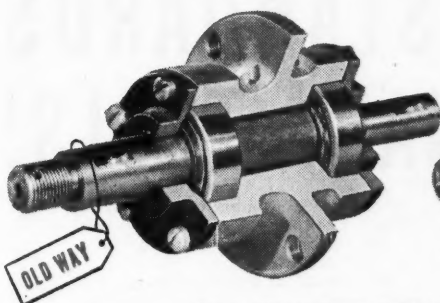
GENERAL OFFICE AND FACTORY: 4522-24 FULLERTON AVE., DEPT. 12, CHICAGO 39, ILL.

EXPORT DIVISION: Engineering Building, 205 W. Wacker Drive, Chicago,

TRUARC trims 13 minutes machining to 6

cuts new exhaust fan bearing unit

- 25% in weight
- 66% in assembly time



Courtesy M. & E. Mfg. Co.

Use of Waldes Truarc Retaining Rings permits housing re-design—eliminates heavy cast bearing caps and screws requiring drilling and tapping; lowers labor and material cost.

"TRUARC PAYS DIVIDENDS IN SAVINGS!" declares M. & E. Manufacturing Company, of Indianapolis, makers of exhaust fans for industry. "Improvements in design made possible by Waldes Truarc Retaining Rings provide a quieter, freer-running assembly, assure longer life to the entire unit, eliminate the hazards of uneven unnecessary pressure on the bearing and minimize future service requirements. In our experience Truarc has definitely proved itself the better method for doing an important job."

Truarc does a better job on axles and shafts for retaining and positioning wheels, pulleys, cams and gears. In widely varied applications, designers find its never-failing grip, its patented design that assures constant circularity, make Truarc the better way to hold machine parts together. Production and maintenance men in many industries see how Truarc rings cut costs sharply, maintain accurate, unvarying relationship of parts. Send us your drawings; Waldes Truarc engineers will be glad to show how Truarc can help you.



WALDES
TRUARC
U. S. PATENT NO. 18,144
RETAINING RINGS



● Send for new Truarc booklet,
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Please send booklet, "New Development in Retaining Rings" to:
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Compare THE LOW PRICE OF CARBOLOY STANDARDS WITH ORDINARY TOOLS!

Surprising, but true!—the price of Standard Carboloy Tools is actually lower than steel tools in sizes $\frac{3}{4}$ " sq. and larger, and but a few cents more in smaller sizes. Check these

typical prices of a Style T-4 Turning Tool against your ordinary tool cost: $\frac{1}{16}$ " sq.—84c, $\frac{1}{8}$ " sq.—90c, $\frac{1}{4}$ " sq.—\$1.32.

Yet—bear in mind, at prices this low—you get a *whale* of an improvement in performance!

Investigate Standard Carboloy Tools—write for Catalog GT-175R. Carboloy Company Inc., 11143 E. 8 Mile Ave., Detroit 32, Michigan.



*For Super Fast
Cleaning and
Finishing . . .*

WITH EXTRA

L-O-N-G L-I-F-E

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Thor

**WIRE WHEEL
BRUSHES**

**IMMEDIATE DELIVERY FROM
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Made in sizes from 4" to 12" diameter with wire from 30 to 36 gauge, Thor brushes are available in all standard types for use on equipment with spindle speeds up to 6000 r.p.m. Write today for new Thor folder No. 538.

INDEPENDENT PNEUMATIC TOOL COMPANY

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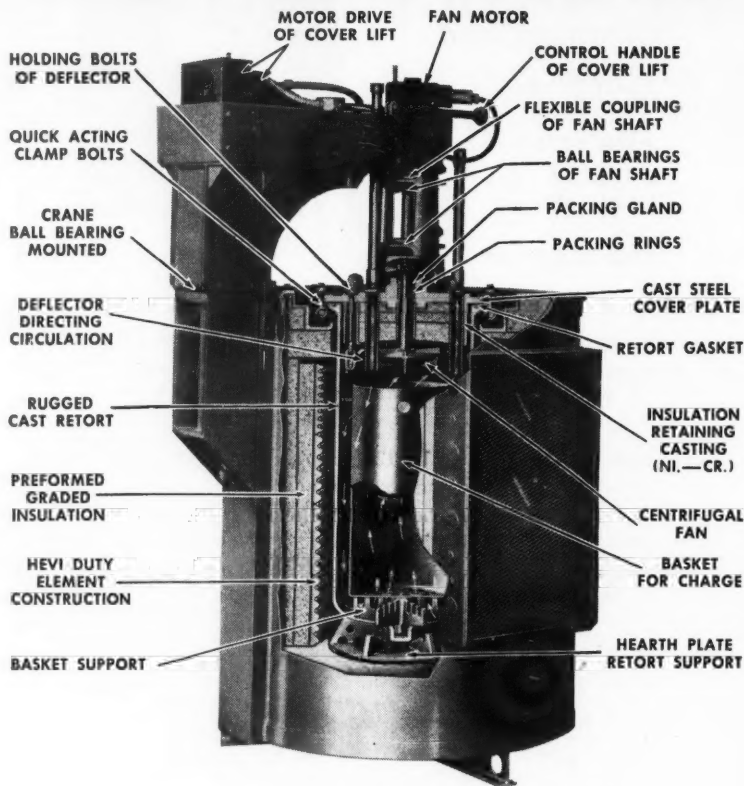
**PORTABLE POWER
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**PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY
ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS**

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• CARBURIZING • NITRIDING • DRY CYANIDING
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A Versatile Tool for Production Heat Treating



Typical Construction of the Hevi Duty Carburizer

Send for Bulletin HD 646

HEVI DUTY ELECTRIC COMPANY

HEAT TREATING FURNACES **HEVI DUTY** ELECTRIC EXCLUSIVELY
MILWAUKEE, WISCONSIN

Convenience-Wide Range And Exceptional Precision

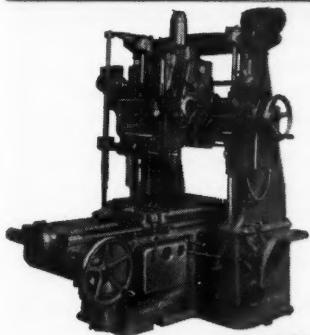


Above: SIP Hydroptic-B Jig Boring and Milling Machine. Table size, $39\frac{1}{2}'' \times 32''$. Accuracy for settings of work-table and spindle head guaranteed to 0.0002". Optical measuring system makes the Hydroptic-B also a measuring instrument of unquestioned accuracy.



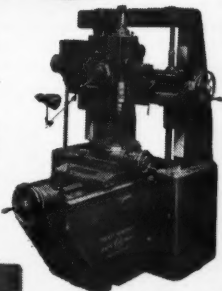
JIG BORERS

American manufacturers who must have the ultimate in precision machining may now obtain all the advantages of famed Swiss workmanship by selecting SIP Jig Borers. Exceptional precision, sturdiness of construction and time-saving features of set-up and operation insure dependable operation over a wide range of work. The Hydroptic-B Jig Boring and Milling Machine (illustrated above) is equipped with a built-in optical measuring system which is completely protected and entirely free from mechanical stress. This advantageous feature has also been employed in the smaller SIP Jig Borer No. 2H (bottom illustration). Each of the complete line of SIP Jig Borers is capable of producing work of exceptional precision, and each is so dependable in operation that it is not only a metal-working machine, but also a measuring instrument of unquestioned accuracy. We represent in the United States the following Swiss manufacturers: Societe Genevoise d'Instrumente de Physique (SIP), Andre Bechler, Mikron, Safag, Studer, Sallaz, Schaublin, Lienhard. With these lines to choose from, we can give expert advice in selecting the correct Swiss Machine Tools and Measuring Instruments for every job.

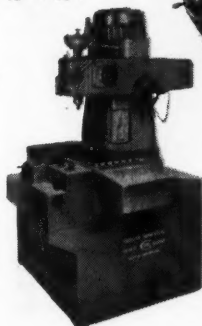


Above: SIP No. 4G Jig Borer. Table size, $27\frac{1}{2}'' \times 23\frac{1}{8}''$. Direct readings to 0.00005".

Below: No. 2H incorporates the same optical measuring system as the Hydroptic-B. Settings to 0.00015". Table size, $27\frac{1}{2}'' \times 12\frac{1}{2}''$.



Above: SIP No. 3K Jig Borer with table $21\frac{1}{2}'' \times 15''$. Direct readings to 0.00005".



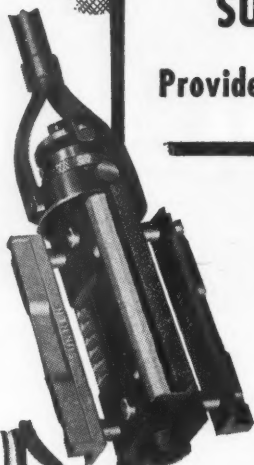
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CORPORATION



CHRYSLER BLDG.
New York 17, New York

HIGH PRECISION MACHINE TOOLS AND MEASURING INSTRUMENTS

In Cylinders from 2" to 14½" in Diameter
SUNNEN Portable Cylinder Hones
Provide Smooth Accurate Internal Finishes



Standard Model
Range 2½" to 14½"



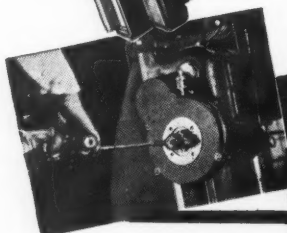
Junior Model
Range 2" to 2.6"

These hones provide a fast, easy, practical, economical way to produce internal finishes that are guaranteed to be accurate within .0005". Straight round holes are produced without disturbing previously established alignment. Sunnen Portable Cylinder Hones produce any commercially required finish with full bearing surface. They correct errors of out-of-round, taper, bell-mouth, wavy condition, distortion—and remove tool marks or other surface imperfections.

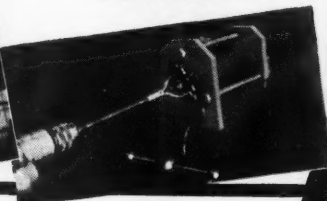
With Sunnen Portable Cylinder Hones stock removal is fast. They are portable, can easily be taken to the job. Free floating universal joint permits operating at an angle. Adjustment is simple, easy and positive. Easy to use, can be set up for operation in one minute. Handles any metal or plastic except lead and babbitt.

Sunnen Portable Cylinder Hones are ideal for *Selective Fitting of Mating Parts—Small Lot or Odd Size Production—Salvage and Production Repairs—Maintenance of Operating Equipment.*

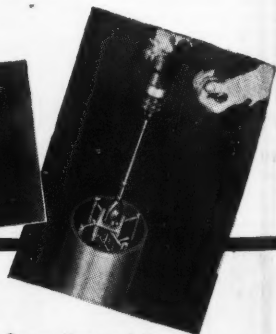
If you have an internal finishing problem, call a Sunnen Engineer—or write for free bulletin, form No. X-AN5001.



Sunnen Portable Cylinder Hone saved dismantling this machine to install a new boring bar.



Portable End Clamping Fixture enables part to be honed accurately without distortion.



Sunnen Hone and Stone Support handles large diameter cylinders easily.

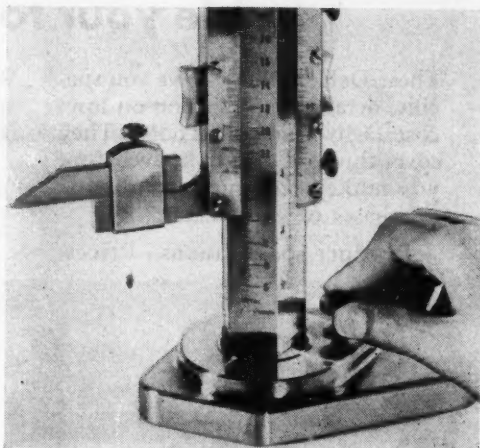
SUNNEN PRODUCTS COMPANY

7933 Manchester Avenue • St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

Another SCHERR time-saver

The new CHESTERMAN HEIGHT GAGE



LARGE, QUICK-READING VERNIER

is practically four times the length of vernier on conventional height gages — 2.450" instead of the usual $\frac{3}{8}$ ".

QUICK AND FINE ADJUSTMENT.

Finger pressure on two lugs permits the head to be slid quickly to a rough adjustment. Fine adjustment is then obtained by micrometer screw operated by the knurled nut in the base (see photo at right). The position of this nut is one of the big advantages of this gage, since unlike usual gage design its operation, even with a heavy hand, has no tendency to shift or rock the instrument.

BOTH ENGLISH AND METRIC READINGS.

One on each face of the column. English scale graduated to $\frac{1}{20}$ ", reads with vernier to $\frac{1}{1000}$ ". Metric scale in millimeters, reads with vernier to $\frac{1}{50}$ mm.

NO "BLOCKING UP" NECESSARY.

The Chesterman is made in 5 sizes: 12", 18", 24", 40" and 48". With capacities like these, even unusual height measurements can be taken without raising the base on blocks.

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Write for bulletin and full details. *New Scherr Catalog just out. 100 pages of valuable data on modern inspection equipment. Write for a copy today.*

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WILDER PROJECTOR—compares a magnified image with a master drawing of the part, instantly detecting inaccuracies . . . **COMPARITOL**—visual, magnified readings to tenths without dependence on "feel." Used widely in volume inspection . . . **GAERTNER TOOLMAKERS MICROSCOPE**—magnified visual inspection of small part profiles. Enables direct and angular measurement . . . **MAGNI-RAY**—magnifies and flood-lights work under inspection . . . **MAGNE BLOX**—greatly increase usefulness of magnetic chucks, holding work vertical or at an angle, holding odd-shaped parts, etc. . . . **TACHOMETERS**—and revolution counters. Extremely accurate in measuring surface speeds as well as rpm. . . . **PRECISION CALIPERS** of stainless steel. Also height gages to 48" . . . **ULTRA-CHEX GAGE BLOCKS** accurate to .000008". Large and small sets, for all needs . . . **ALL PURPOSE GRINDING FIXTURE**—quick, simple and accurate way to grind correct angles on cutting tools. Write for Bulletins.

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... helpful to have when you tackle your tooling problems

These Delta bulletins give you specific, detailed information on low-cost Delta Machine Tools. They cover things it pays to know before you make recommendations for purchases of equipment:

Product specifications. Prices.

Motor recommendations. Accessory listings. Other necessary information.

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Bulletin A-31 pictures and describes Delta Abrasive Finishing Machines (belt and disk types) for sanding, polishing, and finishing operations.



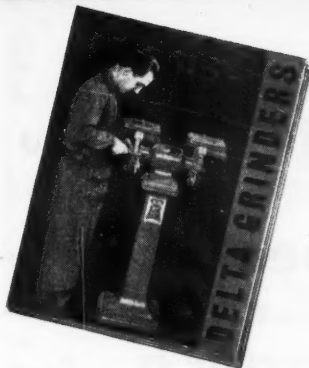
Bulletin A-14 gives you facts about Delta 14-inch Drill Presses — bench and floor types; 1, 2, 3, 4, 5, 6, and 8-spindle models.



Bulletin A-14-3 covers 1, 2, 3, and 4-spindle Delta Super-Hi-Speed Drill Presses, for small-hole drilling — .025" diameter to 1/4"



Bulletin A-17 discusses Delta 17-inch Drill Presses — bench and floor types; 1, 2, 3, 4, 5, 6, and 8-spindle models, with hand or power feed



Bulletin A-23 includes information on Delta Tool-maker* Surface Grinder, Chip-Breaker Grinder, Tool and Cutter Grinder, Carbide Tool Grinder, Industrial Tool Grinder.



Bulletin A-28 tells about the Delta 14-inch Metal-Cutting Band Saw, for cutting almost anything from carbon steel to asbestos.



Bulletin A-20 gives information on Delta Cut-Off Machines—non-ferrous model; abrasive model (adaptable to wood-cutting model).



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M-21A

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5, 6, and
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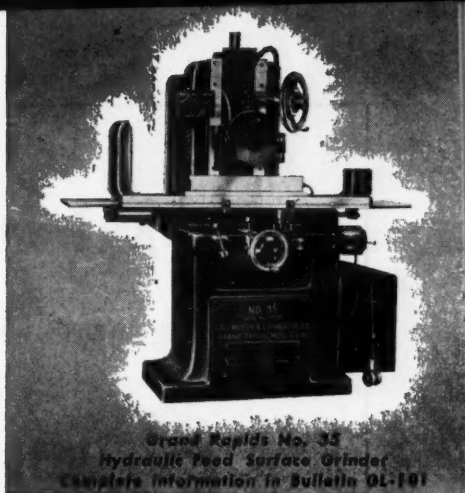
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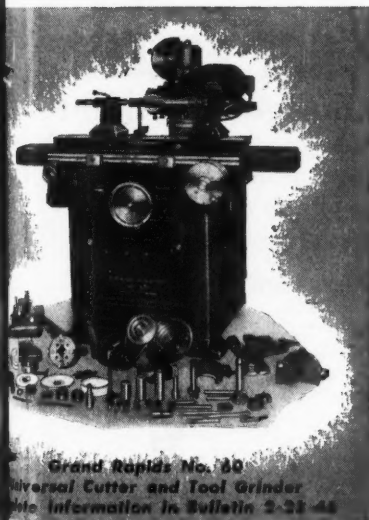
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here's why • Every Grand Rapids Grinder, large or small, has every essential feature for fast, efficient, low-cost production. Refinements in construction details such as the massive castings, heavy, rigid spindles, separate spindle motors, assure years and years of trouble-free life. Grand Rapids No. 60 Universal Cutter and Tool Grinder and No. 35 Grand Rapids Hydraulic Feed Surface Grinder will handle all of your tool room jobs from grinding of dies to sharpening all types of milling cutters, reamers and similar tools.

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SOCKET SET SCREW with the Knurled cup point

And that knurled cup point digs-in and holds fast—
regardless of the most chattering vibration. But still,
—it can be backed-out and used over and over again!

**"Unbrako" and "Hallowell" Products are sold
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Screws originated with
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You can't screw socket screws in or
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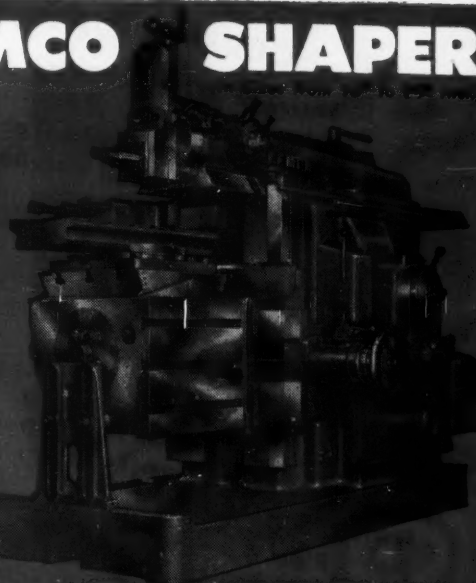


ON A **GEMCO SHAPER**

* THESE 7 USERS TELL YOU WHY...

1. "GEMCO downfeed of head, fingertip touch of traverse, and the Lubrigard Safety features, are perfect."
2. "GEMCO SHAPERS cut the machining time on our motor yokes 25%."
3. "Whenever we have a particularly difficult job to do, we always do it on a GEMCO."
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*EXCERPTS FROM
TYPICAL LETTERS
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Multi-Purpose SHAPERS

Shown above is the Universal Type GEMCO Shaper. It is ideal for tool and die work, or for angular set-ups. Embodying the exclusive Lubrigard Safety features, its life for precision operation is unlimited.

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CENTRIFUGAL COOLANT PUMPS

24 HOURS A DAY . . . 5 DAYS A WEEK
with satisfactory, trouble-free service

PERFECT CIRCLE—as critical about their equipment as they are over the renowned excellence of their piston rings—uses **FULFLO COOLANT PUMPS** in their Hagerstown, Indiana plant.

"They have been giving satisfactory, trouble-free service" . . . and you'll say so, too, if you install **FULFLO** in your own plant. Coolants go just where they should—to keep work cool uniformly, dependably.

Pipe sizes $\frac{3}{8}$ " to $1\frac{1}{2}$ ".
Standard models or for special purposes.

Write for **Fulflo Mechanical Data Book**. Please use your letterhead.



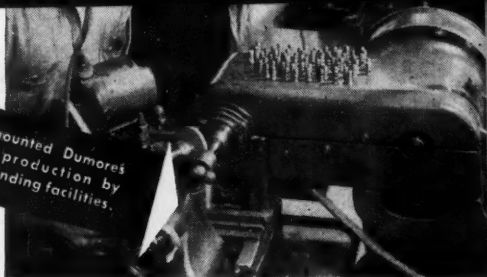
THE



Specialties Co., Inc.
BLANCHESTER, OHIO

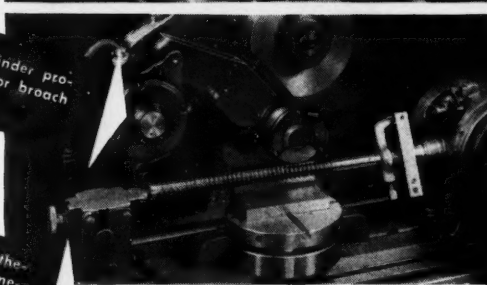
Production

A line of 4 lathe-mounted Dumores used on poppet-valve production by Curlemont Corp., Chicago, provide economical grinding facilities.



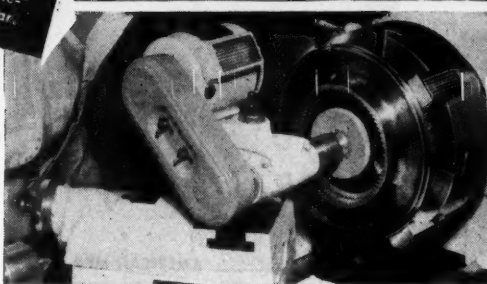
Toolroom

Dumore No. 7 on surface grinder provides high speed and accuracy for broach grinding at Zagar Tool in Cleveland.



Maintenance

Northwest Airlines use lathe-mounted No. 5 to grind chrome-plated bearing seats to size on a propeller reduction gear.



G-5A

Any basic machine tool
plus a Dumore is a

*cost-cutting
precision grinder*

for your production, toolroom, or maintenance shop

Avoid heavy investment in special machines by using versatile Dumore Grinders. They convert basic machine tools — equipment you already have — into dependable precision grinders for cylindrical, surface, tool, and thread grinding.

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26 pages
of cost-
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Please send me, without obligation, my copy of *Here's How*, your manual of the newest techniques in grinding.

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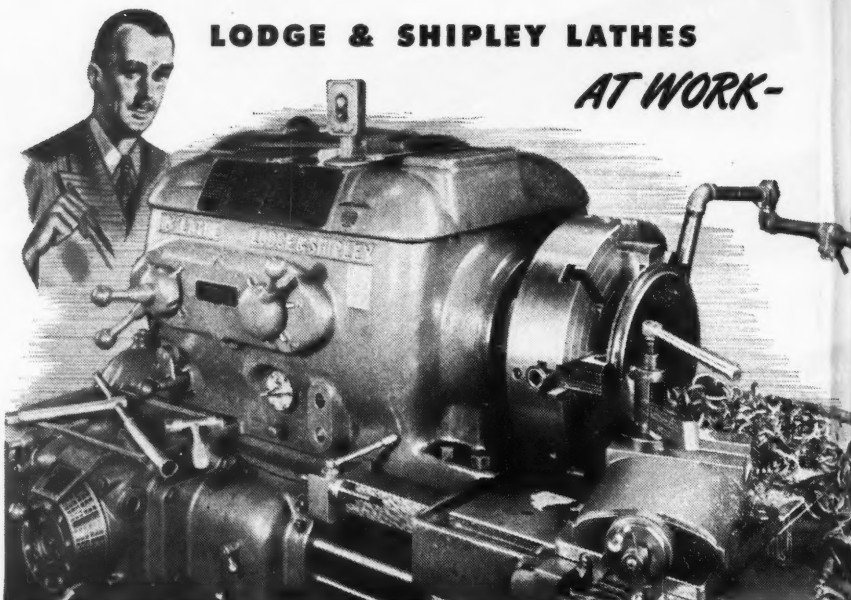
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DUMORE
PRECISION TOOLS

Sold by leading industrial distributors in all principal cities.



LODGE & SHIPLEY LATHES

AT WORK-

OUTPUT: "greater than any lathe in our shop"
ACCURACY: "by far the most accurate lathe"

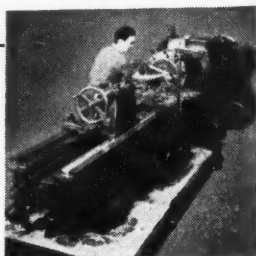


AMERICAN MFG. CO., TACOMA, WASH.

These statements are backed up by actual experience in this noted plant . . . on every day production of precision machine parts—axes, gears, sprockets, worms, bearings, cylinders, clutch yokes and valves.

On every type of machining operation, this customer found the Lodge & Shipley Lathe unequalled. American Mfg. Co., production men noted that "The bulk of our precision work is handled by the L & S—because of its accuracy, time is saved."

This is typical of outstanding results reported by users of the new series of 18, 20 and 22 inch L & S Lathes. These lathes are completely new in every detail from pulley to tailstock . . . may possibly replace several older, worn and weary tools.



Lodge & Shipley Engineers will demonstrate just how these modern lathes can improve your production—cut your costs. Write on your company letterhead for Bulletins Nos. 503, 605 and 606.

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CUTS SCREW DRIVING COST 50%

THIS manufacturer of vacuum cleaners formerly used Yankee screw drivers for assembly operations. He called in the Rotor Application Engineer to find out if the output per man could be improved. By installing Rotor M-851, 1000 R.P.M. midget air screw drivers, they got these results:

Twice the output per man. These air tools, weighing only 2 lbs., put zip into the assembly. With one hand, the operator drives screws

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A better job. Equipped with the X-11 Double Adjustable Clutch, these Rotor tools drive screws uniformly to any desired tension.

The Rotor Application Engineer will gladly apply his tool know-how to the cutting of *your* costs. Ask for copy of Bul. 30.

Yours for faster production,

AIR O'TOOL

THE **ROTOR TOOL** CO.
CLEVELAND, OHIO

HIGH
CYCLE

ENLARGED ANALYSIS OF PORTABLE TOOL DRIVEN



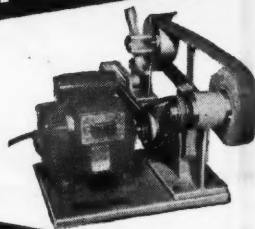
Do your men
get
3 O'Clock
Fatigue



THE CN-2 ABRASIVE BELT GRINDER

Comprising Resilient Contact
Wheel—Idler—Abrasive Belt—Platen
—Driving Pulley and Arbor—Motor
mounting (Electric
motor not included)

KEEPS PRODUCTION HIGH ALL DAY



Your operators find belt grinding easier because the grits are exposed for work . . . They do not have to "lay on" as they do with an abrasive or loaded wheel . . . and production stays high because they do not suffer "3 o'clock fatigue."

The CN-2 eliminates wheel loading . . . wheel digging . . . wheel dressing. Grinds on contact wheel, platen, or free belt.

CN-2 increases output over ordinary bench grinder by 200%! Use the CN-2 for deburring, bevelling, chamfering, clean-up, knocking-off corners . . . In many other operations in assembling and machining departments, tool rooms, job shops, service stations.

Arbor for contact roll and V-pulley permits use of unit independent of a bench grinder. Easily adjusted for vertical or horizontal use within 90° arc. Weighs only 15 lbs. Write today for full information on CN-2 Abrasive Belt Grinder.

PORTER-CABLE

MACHINE CO.

300-2 WOLF ST.
SYRACUSE, N. Y.



1939



1947

Same Job ...

Same Operator ...

Same Machine ...

Same Productive Volume

but

UNIT COST UP 35%

Thousands of shops face this picture. After reconversion, they are again producing the same parts in the same volume as in the best prewar year. Operators' skill and machine productivity may be fully up to 1939 records.

But accurate surveys of over 2500 metal working plants disclose that today's cost of materials, overhead, and labor are 35% above 1939.

To make up for these higher costs

and to maintain a satisfactory margin of profit without resorting to a steep rise in selling price, present management a serious problem.

If your production processes include turning of metal parts, a Warner & Swasey field engineer may be able to help you. After studying your jobs, he probably can recommend improved machines, new tools and methods, or suggest accessories to be added to your old turret lathes to make them more productive.

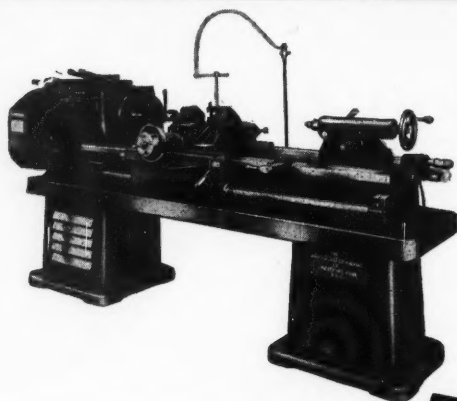
*You can Machine it Better, Faster, for Less...
with a Warner & Swasey*



TURRET LATHES, MULTIPLE SPINDLE AUTOMATICS. PRECISION TAPPING & THREADING MACHINES

40 YEARS of EXPERIENCE

produced
the new **COULTER**
AUTOMATIC THREADING LATHE



The many different and number of threading tools which can be arranged on the tool slides both front and rear, make this machine the most versatile of any for production of square, standard, and 29 degree threads, both internal and external.

Equipped with disc clutch . . . Easy to operate . . . Rigid Construction . . . Four speed headstock . . . Return or Idle travel speed has been increased five times cutting speed.

PRODUCTION MACHINES SINCE 1896

Write for full particulars

The James **COULTER** *Machine Co.*

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The *Air Valve* You Have Been Looking For

PILOT OPERATED • SOLENOID CONTROLLED

** A New ROSS Piston Poppet Type Valve*

✓ **FAST OPERATING**
as high as 400 cycles per minute.

✓ **LARGE ORIFICE AREA**
results in fast exhaust, minimum restriction to air flow.

✓ **POSITIVE SEAL**
by line pressure.

✓ **SIMPLICITY OF DESIGN**
removing end plugs permits replacement of piston poppet assembly — no need to disturb piping or to move valve from position — no "down time".

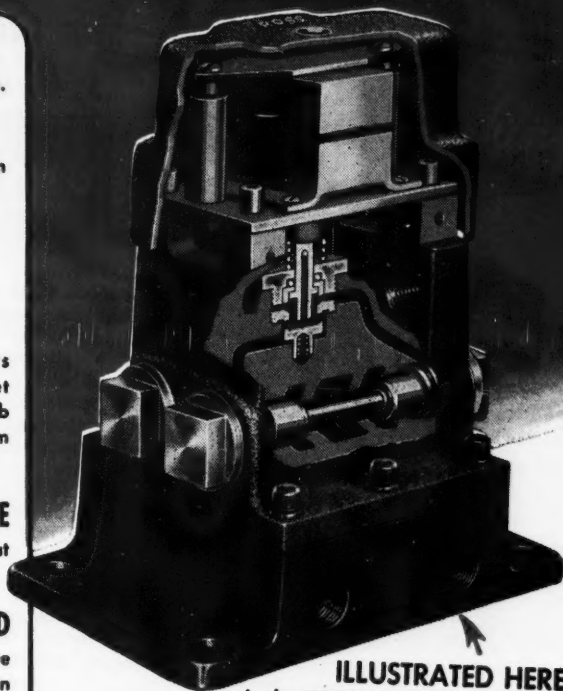
✓ **ECONOMICAL TO OPERATE**
current consumption 1.2 amps. at 110 volts — 60 cycle.

✓ **LONG SERVICE ASSURED**
many Ross valves installed more than 20 years ago are still in active service.

✓ **SMALL AND COMPACT**
appreciated where space is limited.

✓ **ALL PARTS**
non-corrosive metals.

✓ **ACCURATELY MACHINED**
and all parts interchangeable.



ILLUSTRATED HERE
is the FOUR-WAY $\frac{3}{4}$ " Capacity

Available in:-

- **THREE-WAY**
normally open, or normally closed
- **FOUR-WAY** and
- **FOUR-WAY, Five port.**
may be had in $\frac{1}{4}$ ", $\frac{3}{8}$ ", $\frac{1}{2}$ " and $\frac{3}{4}$ " pipe size

ROSS
Air Control
VALVES

A TYPE AND SIZE
FOR EVERY PURPOSE
★
OVER 100 DIFFERENT MODELS



THE BRIDLE FOR AIR HORSEPOWER

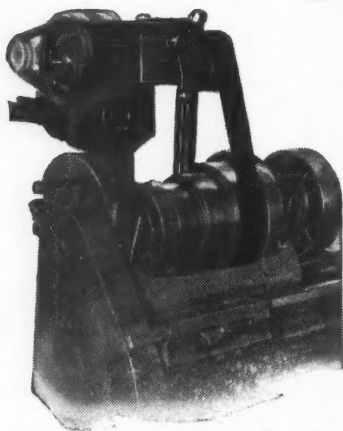
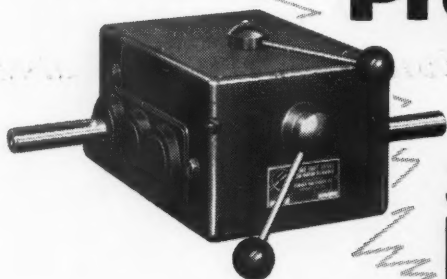
ROSS Operating VALVE CO.

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There Is

Production Magic

in the New
3,4,6,9-SPEED



**No. 509 L
LATHE DRIVE**



**No. 309 SMB
SPECIAL
MOUNTING
BASE**

Get more work from your older machine tools ... make them carry a full production load. Install the Turner UNI-DRIVE! This remarkable selective sliding gear transmission is now equipped with 3, 4, 6, and 9 speeds. Provides proper speed for any job. Operates each machine independently ... eliminates overhead line and counter shafts. No belts to shift. Makes machines more versatile. Boosts output ... saves time ... reduces power costs. Drives to large step of machine cone at all speeds. Thousands are in use, with outstanding production records.

Lathes, turret lathes, shapers, milling machines, hand and automatic screw machines, boring mills, hobbing machines, bench and small machine tools and dozens of other applications produce with increased efficiency with UNI-DRIVE. Two handles shift speeds through three ranges of three speeds, 3 to 1 ratio in each range ... overall ratio $9\frac{1}{2}$ to 1 in the 9 speed transmission. Also available are the new "slow speed" series. Built with one additional reduction, these will be 50% slower throughout the same cycle of ratios.

Now is the time to speed up your plant ... now is the time to install the Turner UNI-DRIVE!

**Write Today for Complete
Specifications and Prices**

TURNER UNI - DRIVE COMPANY

(Sales Div., Turner Machinery Co.)

Dept. 105, 3416 Terrace St., Kansas City 8, Mo.



Surface Broaching

FOR MACHINING SLOTS

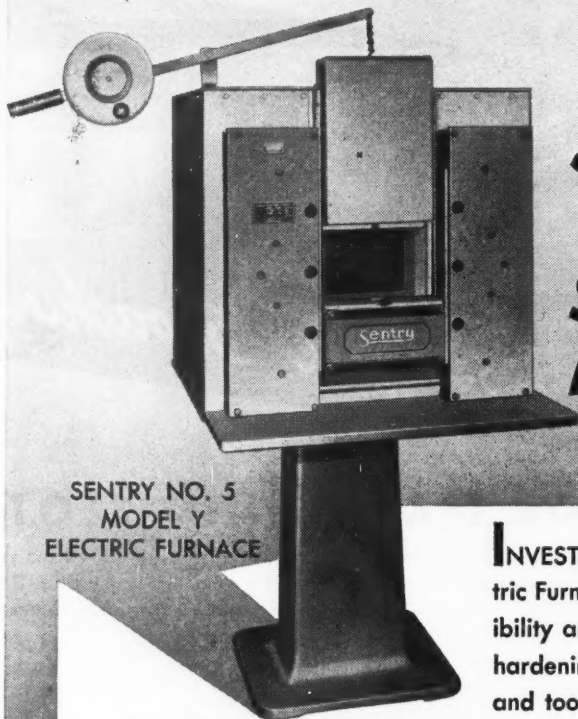
The machining of slots on parts made in large quantities presents a problem profitably solved by surface broaching. Each application is individually engineered with rapidly operated fixtures for easy loading and with broaches designed to take full advantage of the capacity of the machine. Multiple slots are automatically handled by means of indexing fixtures. We will be glad to study your machining problems and make recommendations on the use of Footburt Surface Broaching Equipment. Send blueprints and hourly production required.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building

FOOTBURT *Surface Broaching*

Footburt Patented Tooth Form



SENTRY NO. 5
MODEL Y
ELECTRIC FURNACE

SAVE WITH SENTRY FURNACES

INVESTIGATE Sentry Electric Furnaces for high flexibility and economy in the hardening of small parts and tools made of molyb-

denum, tungsten or cobalt high speed steels. Two or more Sentrys, operated as needed, cost less to operate than large, old type equipment run at less than full capacity.

Sentrys are clean, fast heating (from cold to 2350° in about 1 hour) and economical. Waste no fuel. The Sentry Diamond Block Method of Atmospheric Control assures true-to-size work of maximum hardness, saves finishing operations.

Write for catalog just off the press describing Sentry Furnaces and the Sentry Diamond Block Method. Ask for bulletin 1054-EL.



The Sentry Company
FOXBORO, MASS., U. S. A.



HANDEE

Reg. U.S. Pat. Off

TOOL OF 1001 USES

JACK OF ALL TRADES AND MASTER OF PLENTY

It's quick, it's deft, it's conveniently small, yet the Handee Tool packs a terrific wallop! Handee is the original, single hand controlled, electrically driven tool—and it's the finest today. It can be used at the bench or carried right to the job. It reaches hard-to-get-at places on machinery, touches up perishable tools, grinds, dies, chip breakers on broaches, removes burrs, etc. Runs at a cool 25,000 rpm. AC or DC. Wt. 12 oz.

Combined with its accessories and exclusive attachments, the Handee Tool performs more operations with greater accuracy than any other portable electric tool at any price.

PRECISION ATTACHMENTS

Fit Handee only. Offhand carving, routing, shaping is exact as to depth of cut, accuracy of line. Indispensable to pattern shop. Set of 6, postpaid, \$7.95.

HANDEE KIT

Strong, compact steel carrying case holds the Handee Tool and a complete assortment of accessories. Postpaid, \$27.50. Handee with 7 accessories only, \$20.50.

CHICAGO ACCESSORIES

Fit any power tool. The most complete line available. Over 500—all finest quality. The right one for every job!

Write for 64-Page Catalog

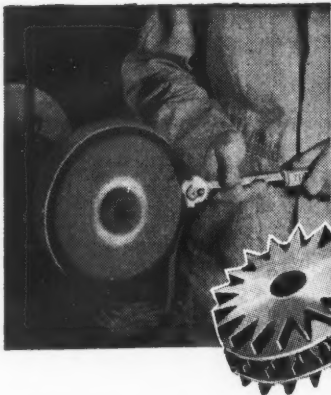
CHICAGO WHEEL & MFG. CO.

1101 West Monroe Street, Dept. MM,
Chicago 7, Illinois

GRINDS,
DRILLS, CUTS,
SAWS, ROUTS,
POLISHES, ENGRAVES,
CARVES, SANDS, ETC.

**IMMEDIATE
DELIVERY**

ORDER NOW



**SPECIAL STEEL and
EXCLUSIVE HEAT TREAT**

assure

**TOUGH, ACCURATE
GRINDING WHEEL
DRESSER CUTTERS**

Made of special steel—heat-treated by an exclusive VINCENT process, VINCENT-HUNTINGTON Improved Grinding Wheel Dresser Cutters insure long life . . . clean dressing. Exact hardness and controlled heat-treat prevent teeth from mashing or breaking. Accurate, fast and sturdy—they will do the jobs best for all your hand dressing operations.

Complete stocks in all styles and sizes are carried at your mill supply house. Order a trial quantity . . . the proof is in the using.

**FOR CORRECT DRESSER
SIZE USE THIS CHART**

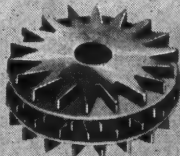
- ★ Use #0 Dressers on Wheels up to 1½" Face.
- ★ Use #1 Dressers on Wheels 1½" to 2" Face
- ★ Use #2 Dressers on Wheels over 2¼" Face
- ★ Use #11 or #22 Dressers on Wheels of extra wide Face



Vincent

**HUNTINGTON
NEW IMPROVED**

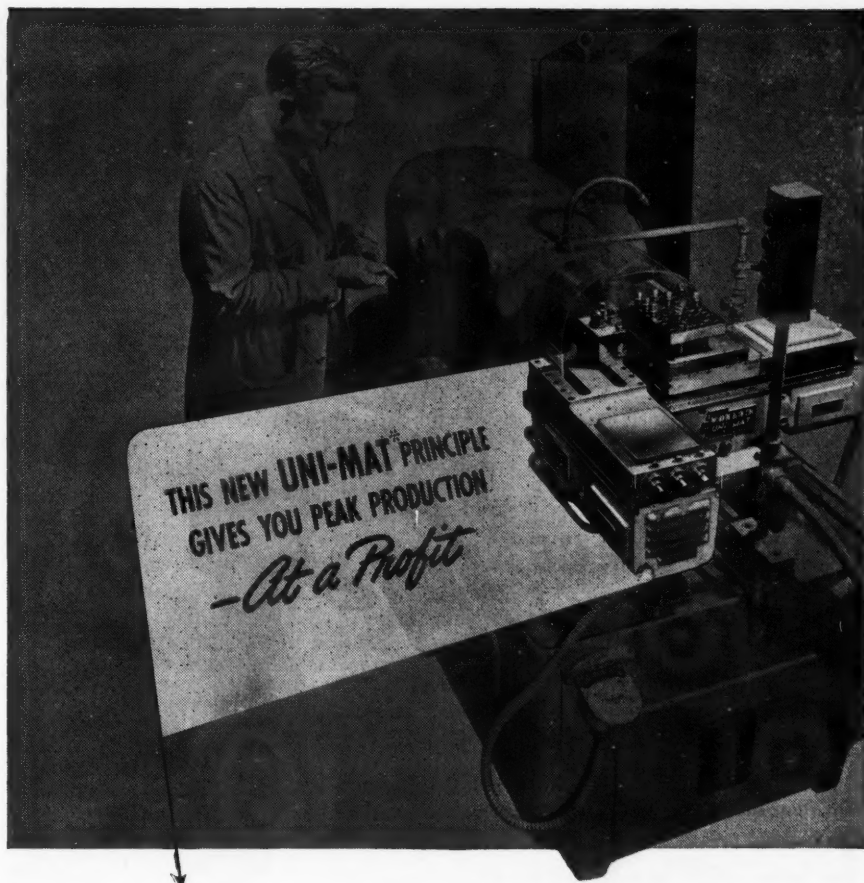
**GRINDING WHEEL
DRESSERS and CUTTERS**



Vincent

**STEEL PROCESS
COMPANY**

2424 BELLEVUE AVE • DETROIT 7, MICHIGAN



If you're doing chucking work on bushings, bevel gears, bearing cups, bearing caps or disc shaped parts—as small as 1" and up to 16" diameter—you'll want to know all about Monarch's new universal automatic turning machine, the Uni-Matic.

Through application of the Uni-Mat principle, this revolutionary machine combines maximum production with universal adaptability.

Uni-Mats can be used singly or in combinations of two or more. They can be interchanged. They can be positioned universally, through 360°. They'll turn

straight diameters or bevels with equal ease and accuracy. Electronic control not only makes their operation fully automatic but permits exact timing to eliminate cutting air.

When you want peak production at a profit you'll want the new Monarch Uni-Matic. For complete information, ask for Bulletin 1701.

* Uni-Mat — Monarch's exclusive independent motor-driven tool slide.

The MONARCH MACHINE TOOL CO.

★ **SIDNEY, OHIO**



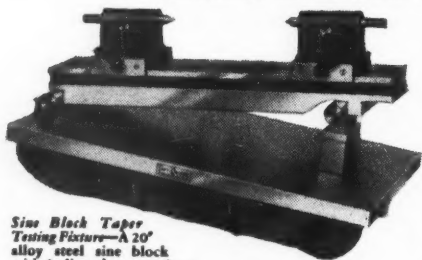
FOR TOP PRECISION

*in measuring Angles
and Locating Work*

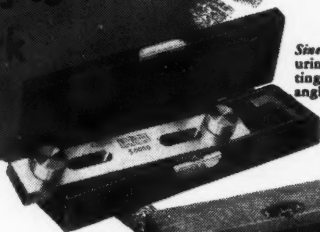
... use these **TAFT-PEIRCE** **Toolroom Specialties**

These tools are but a few of those available from Taft-Peirce stock for measuring angles and locating work to a given angle with the utmost accuracy. Tops in their field, they are a product of the Taft-Peirce Small Tool and Gage Division, and are indispensable for inspection and set-up departments in maintaining high standards of accuracy. For further details of these and other angle-measuring equipment, write today for the new Taft-Peirce Handbook.

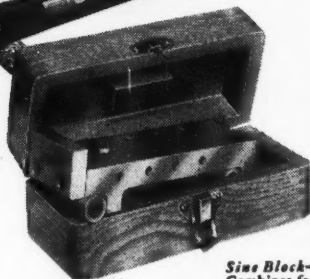
THE TAFT-PEIRCE MFG. COMPANY WOONSOCKET, RHODE ISLAND



*Sine Block Taper
Testing Fixture—A 20"
alloy steel sine block
with 2 aligned center plugs.*



Sine Bar—For measuring angles or locating work to a given angle. 3" to 20" sizes.



Sine Block—Combines features of 5" sine bar and a right-angle iron.



Sine Bar Fixture—A sine bar, clamping device, and base constructed as a single integral tool. 5", 10" sizes.



*Angle Block and Sine
Bar Set—Comprises a
3" sine bar and 13 pairs
of 4" angle blocks.*

**PICK THIS
BLADE**

Griffin
SPECIAL ALLOY

**to Cut
Production Costs**

For longer service—often eight to ten times the life of ordinary tungsten steel blades—the **GRIFFIN SPECIAL ALLOY** power machine blade is your best buy. Molybdenum high speed steel, with strong, raker-set teeth. Made also in hand frame sizes.

OTHER GRIFFIN BEST BUYS

For clean, accurate cutting of tough alloy steels, pick the **GRIFFIN HIGH SPEED STEEL** blade; 18-4-1 tungsten high speed steel; in power machine and hand frame sizes . . . For general hand frame use, pick the improved **NEW GRIFFIN**; flexible as a soft-back, tough as an all hard . . . For sawing thin sheet or tubing by hand, pick the **GRIFFIN NON-STRIP**, with the teeth that don't break off . . . For precision contour sawing pick **GRIFFIN BAND SAWS**—choice of hard-edge-flexible-back, spring-temper, skip-tooth and wood-cutting types.

Ask your distributor for Griffin Blades. For new 20-page Griffin Price List, write us.

General Sales Agent

JOHN H. GRAHAM & CO., Inc.

Dept. D, 105 Duane St., New York 8, N. Y.

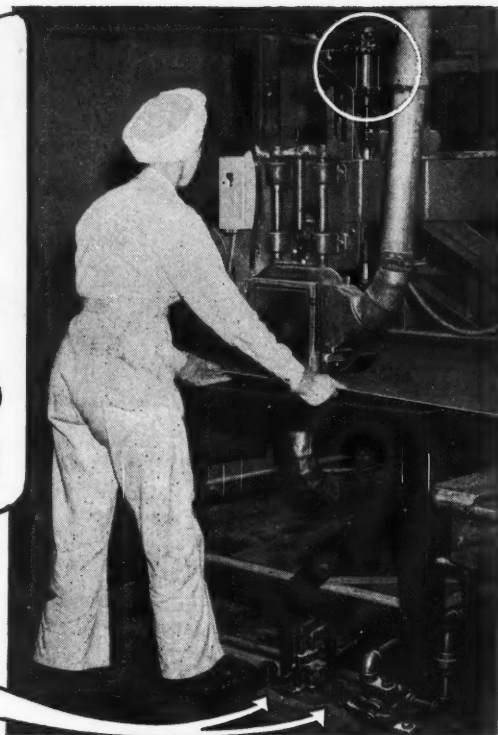
GRIFFIN 

**HACK SAW BLADES
AND BAND SAWS**

MADE BY G. W. GRIFFIN CO., FRANKLIN, N. H.
Established 1888

FOOT-CONTROL

Speeds
DEFECT-CUTTING
in Veneer Plant



Cutting out surface defects in veneer panels is simplified and accelerated by the use of NOPAK equipment at Pacific Veneer Co., New Westminster, B.C. Here a NOPAK Model E Air Cylinder actuates vertical movement of the veneer cutter. The cylinder is controlled by a NOPAK Model R Foot Valve, leaving the operator's hands free to position the panels quickly and accurately . . . greatly increasing cutting capacity. The other foot valve shown is a NOPAK Model RN, with neutral holding position, which controls a cylinder on an adjacent machine.

GALLAND-HENNING MFG. CO., 2758 S. 31st ST., Milwaukee 7, Wis.

Production Men . . .

This application of NOPAK Valves and Cylinders may suggest how the operating cycles of certain machines in your plant can be speeded up and manual effort decreased.

NOPAK

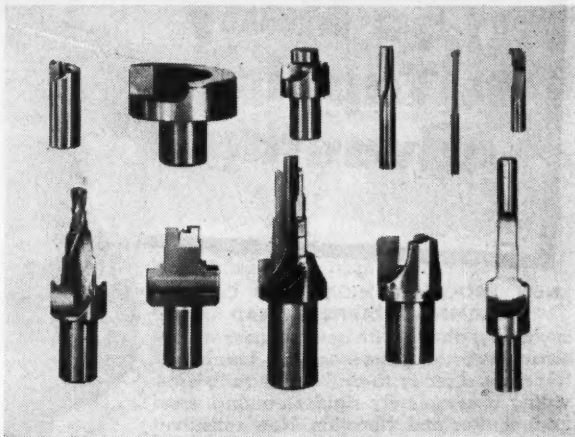
VALVES AND CYLINDERS

DESIGNED for AIR and HYDRAULIC SERVICE

A 5148-1P

J&S "TOOL SENSE" reads between the lines of your FORM-TOOL specifications

Concentration on the production of the most intricate Form-Tools for many years, enables us to "sense" the idea behind a customer's blue print. Even though the designer may find it hard to put his exact thought on paper, we can usually "fill in the blank spaces." This "tool sense," plus extremely rigid inspection at every step in production, save our customers costly delays due to rejections.



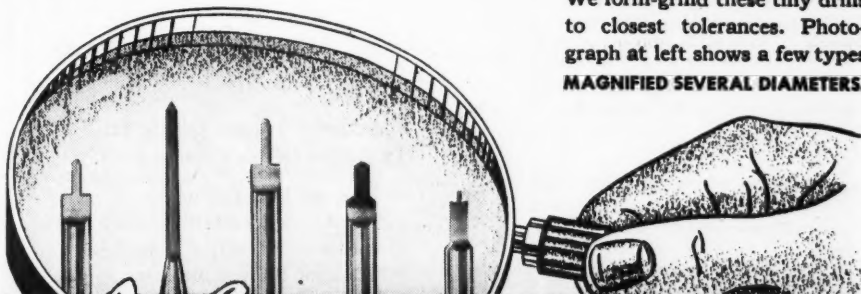
Among the Form-Tools we produce are: counterbores, cold-heading dies, counter-sinks, taper reamers, gun drills, flat drills, end cutters, boring tools, step drills, hollow mills, recess tools and combination tools. Send us your blue prints for quotation today.

J & S Spiral Form-Tools

J & S equipment of exclusive design, reducing man-hours required to form-grind Spiral Tools, now makes them economical for many more applications.

J & S Form-Tools for makers of Watches, Clocks and Motors.

We form-grind these tiny drills to closest tolerances. Photograph at left shows a few types **MAGNIFIED SEVERAL DIAMETERS.**



J&S

TOOL CO. 477 Main St., East Orange 5, N. J.

Manufacturers of "Fluidmotion" Reamers and Angle Drills

No Other Tapping Head Offers So Many Tapping Advantages!

NEW PROCUNIER HIGH SPEED COVER CLAMPING TAPPING HEAD

is way out ahead with new features which mean *faster tapping—less tap breakage*. It clamps directly to drill press quill, providing a completely rigid mounting, free from chatter and vibration. New sensitive double-cone friction clutch engages the surfaces of the drive and reverse shells with a soft "cushioned action." Operators quickly detect dull or "loaded" taps just by the pressure needed to drive the tap. The heat treated gear reversing mechanism; the ball bearings for accuracy and long life; the simple "one-shot" lubrication; the new lighter, smaller and more accurate "Tru-Grip" Tap Holder—all these features and many more mean new economy, new accuracy with this High Speed Procunier Tapping Head.

A complete line of Procunier High Speed Tapping Heads is available, including heads to fit most makes and sizes of drill presses—write today for illustrated bulletins.

Write today for illustrated
bulletins giving complete
specifications and prices.



Procunier

Safety Chuck Company

12 S. Clinton St.

Chicago 6, Ill.



NEW "TRU-GRIP" TAP HOLDER

Lighter, more accurate, this tap holder drives the tap by the square of the shank—holds it in alignment by the round—tap shanks are never "chewed up."

PROCUNIER SAFETY CHUCK CO. 12 S. Clinton St., Chicago 6, Ill.

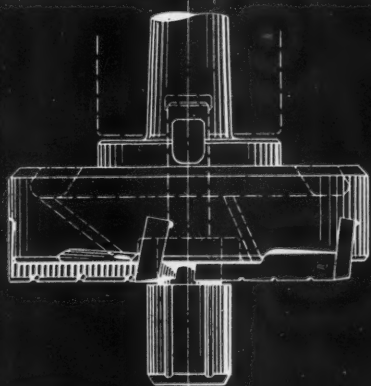
Send me bulletins on

- ☐ Procunier High Speed Tapping Heads
- ☐ Procunier "True-Grip" Tap Holders
- ☐ Universal Tapping Machines

Name

Address

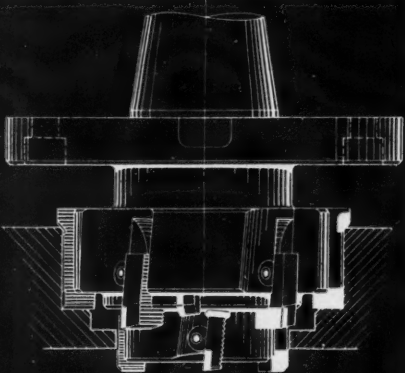
City State



Put Teeth into Production

Gairing inserted blade cutter-heads combine simplicity, rigidity, and adaptability (multiple operations in one head) with ease and speed of adjustment.

Greater rigidity increases their ability to take heavier feeds. They provide solid, positive, independent support to the blades which may be of high speed steel, hard alloys, or tungsten carbide. Blades are designed with correct angle, positive or negative rake, and proper projection of the blades from the body. They

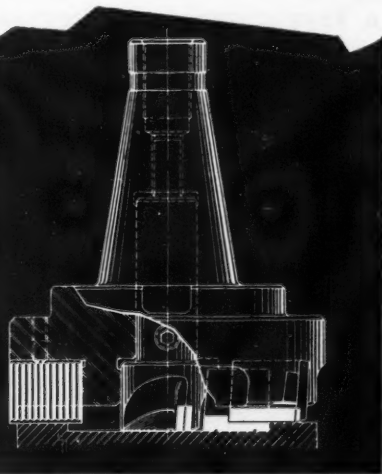
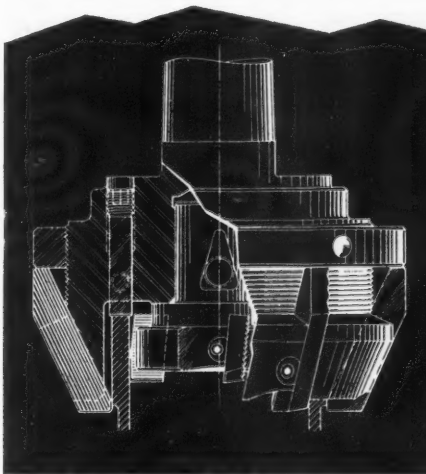


are replaceable at a fraction of the cost of solid tools.

Gairing cutter-heads efficiently combine several cutter operations in one tool because the relation of each cutting edge is easily maintained and perfect concentricity between diameters is assured. Also—and this is important: Setup time on machining operations involving close tolerances is greatly reduced.

Our Engineering Department will gladly discuss any heavy cutting tool problem you have.

THE GAIRING TOOL COMPANY, DETROIT 32, MICHIGAN





INCREASED PRODUCTION AT NO EXTRA COST
10 HOURS PRODUCTION IN 8 HOURS WORKING TIME IF YOU USE
A FAST CUTTING MANHATTAN WHEEL ON YOUR PORTABLE TOOL

It is false economy to consider wheel cost alone. The number of production units per wheel is not the only cost factor. More important is the number of units per day! Today's higher cost of man-hours demand increased output. Send for a MANHATTAN field engineer. He will show you how to increase production through the selection of a fast cutting MANHATTAN grinding wheel.

RUBBER BOND

RESINOID BOND

Ask about the new V.D.B. (Vibration Dampener Bushing) Wheel.
 Reduces fatigue and strain on operator.

ABRASIVE WHEEL DEPARTMENT



RAYBESTOS-MANHATTAN INC.

Keep Ahead with Manhattan

MANHATTAN RUBBER DIVISION • PASSAIC, NEW JERSEY

TOOLS for PRECISION PRODUCTION

MEEHANITE is an engineering material with strength properties that place it in competition with other strong metals . . . plus, the many good properties of a good gray iron.

MADE FROM MEEHANITE METAL

Surface Plates
Masterangle Plates

Masterangle Plates

Angle Attachments

Try Squares

Straight Edges
Flat Parallels

Angle Attachments

Try Squares
Angle Plates

Box Parallels
Lapping Plates

Universal Right Angles
Toolmakers' Knees

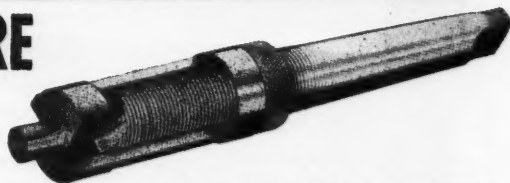
MEEHANITE represents an outstanding development in the metallurgy of gray iron. The process eliminates the undesirable variations of structural constituents which occur in common gray iron. A new material is created in which the structural form of the matrix and the quantity and distribution of the graphite are under actual control.

Write for Literature

COUNTERBORE

and

SPOT FACER



with MOVABLE INSERTED CUTTERS

Made in 50 Standard Sizes from 9/16" to 3 1/2" diameter. Features include—easy removal of cutter for sharpening, cutting edge of cutter always in same location, cutter locks securely, pilot drilled and tapped to hold different size bushings, etc.

PROMPT DELIVERY

• WRITE FOR LITERATURE

P
PRECISION
PRODUCTION
TOOLS

ACME TOOL COMPANY

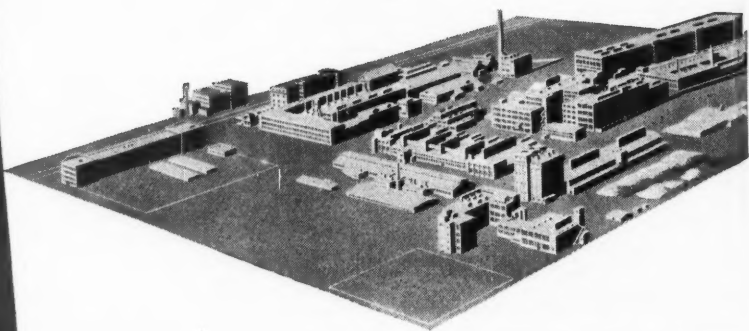
96 WARREN STREET

• NEW YORK 7, N. Y.

A BUYING GUIDE FOR ABRASIVES

POINT No. 1

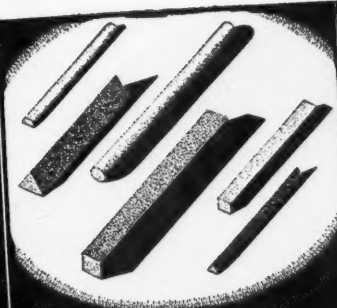
MANUFACTURING RESOURCES



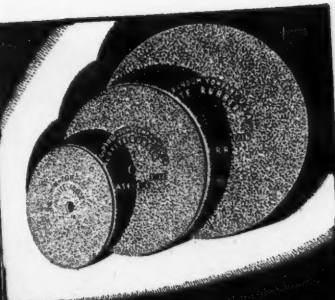
It is understandable to anyone in Production that better manufacturing resources generally lead to a superior product. Quality is not to be had for the mere wishing. The vast manufacturing facilities of The Carborundum Company are known to be an important part of the nation's industrial picture, and are pointed to as being in the forefront of manufacturing and technical progress. Not the least of the reasons for the satisfying, uniform, and dependable quality of Abrasives by CARBORUNDUM are the spacious, modern, alert and efficient manufacturing facilities which produce those abrasives. The Carborundum Company, Niagara Falls, N. Y.



A Good Rule for Good Grinding



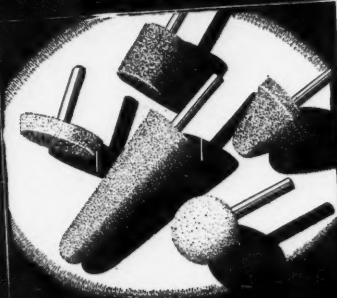
Tool Room sticks and stones that cut fast... last long... and hold their form.



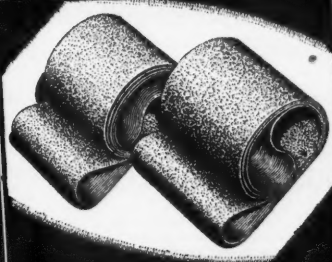
Cutting-Off Wheels... the modern tool for faster, less costly, more finished cuts



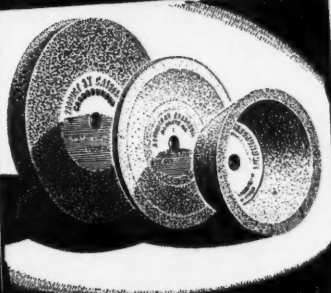
Long lasting Discs for both flat and curved surfaces.



Mounted wheels, in all standard grits and grades, for portable grinding equipment



A Coated Abrasive for every sanding and finishing condition



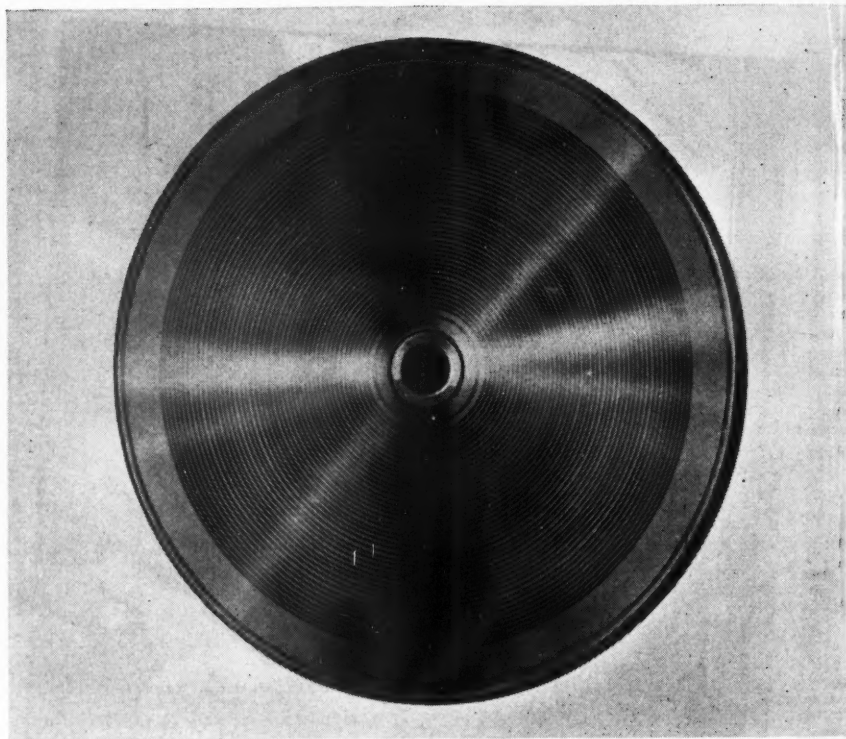
All standard shapes are supplied in grinding wheels by CARBORUNDUM

... CALL IN

CARBORUNDUM

TRADE MARK

● BONDED ABRASIVES ● COATED ABRASIVES ● ABRASIVE GRAINS AND COMPOUNDS



Again WALKER is in the forefront. A new **ALL-PURPOSE** Rotary Magnetic Chuck design, that incorporates all the characteristics of past designs in this composite Chuck.

This Chuck is adaptable for small as well as large pieces. Suitable for Auxiliary Plate adaptation.

Avail yourself of the **WALKER ENGINEERING SERVICE**. No obligation.

Walker Chucks

O.S. WALKER COMPANY
INCORPORATED

ORIGINAL DESIGNERS AND BUILDERS OF MAGNETIC CHUCKS

MAGNETIC CHUCKS • GRINDING MACHINES
WORCESTER 6, MASSACHUSETTS

A Few Facts You Should Know

About "Acorn" Dies

SIMPLE CONSTRUCTION • EASY TO OPERATE • FACTORY TESTED

To understand the operation of the "Acorn" Die, one should see it in relation to the "Acorn" Die Holder as pictured at the right in sectional view. The feature which makes the "Acorn" Die so convenient and accurate is the manner in which the four prongs or threaded lands are compressed when the holder cap is screwed down onto the holder. As all bearing surfaces on the holder and die are ground to insure correct alignment and accuracy, even pressure is brought to bear on each of the prongs simultaneously so that they all adjust equally and concentrically. This is done quickly and automatically by tightening the cap and turning up the lock nut. No other adjustments are necessary.

A positive adjustment to size can be obtained by using the threaded plug which comes with every "Acorn" Die. This plug has actually been threaded by the die in which it is shipped and has been carefully checked for accuracy. Thus, if it is used as a setting plug, accuracy of the set up will be assured. *For close to shoulder work, quick change over of jobs, accurate threads, specify "Acorn" Dies to your local Greenfield Distributor.*

HOLDERS ADAPT "Acorn" Dies FOR ANY MACHINE



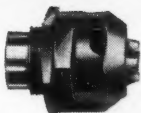
REGULAR

Regular "Acorn" Die Holder with longitudinal float which allows the die to follow its own lead independent of any lag in the machine. This holder may be used on practically all automatic screw machines and any other machines which provide for automatically reversing the die or rod at the instant when the desired length of thread has been cut.



RELEASING

Releasing "Acorn" Die Holder, while suitable for all machines, is especially recommended for hand operated machines. The improved clutch mechanism allows the holder to be released without shock.



ADAPTER

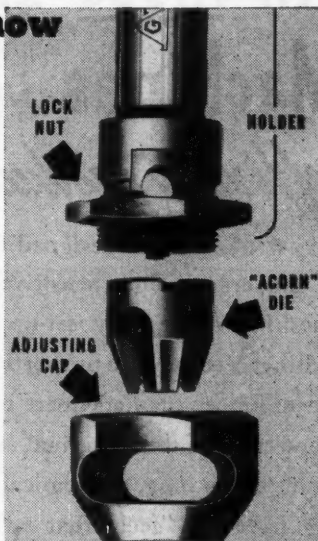
The "Acorn" Die Adapter permits the use of "Acorn" Dies with existing round die holders. It consists of three parts, a Cap to hold and adjust the die, a Lock-Nut to secure the adjustment and a Body. The shank fits round or spring die holders of corresponding size.



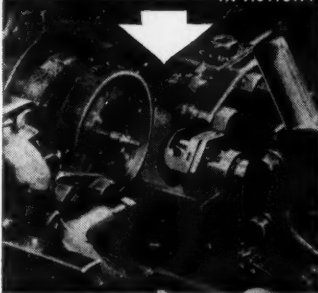
ASK YOUR "GREENFIELD" DISTRIBUTOR FOR 12 PAGE "ACORN" DIE BOOKLET!

GREENFIELD

DIE CORPORATION • Greenfield • Massachusetts
and its New Haven Division The GEOMETRIC TOOL COMPANY

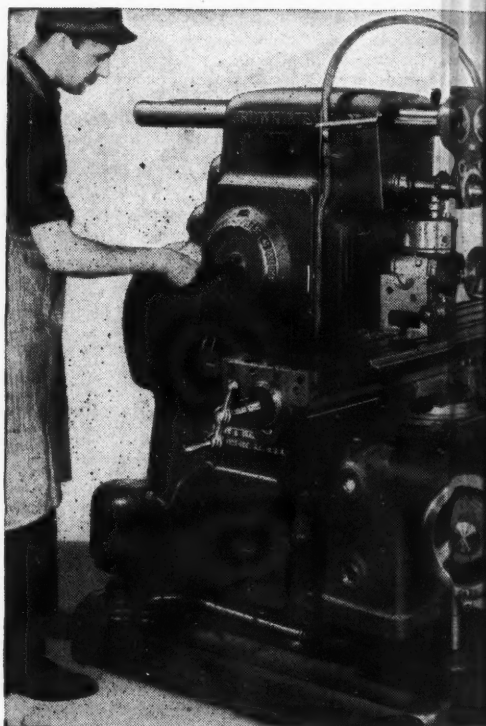


REGULAR HOLDER and DIE IN ACTION!



In these Light Type Milling Machines --- *All the features for efficient production in toolroom and shop*

BROWN & SHARPE designed these moderate weight, sensitive machines for rapid, easy set-up and handling. Yet they are proportioned to insure more than adequate rigidity and to hold their original accuracy through a long, economical life. They have the "feel" that satisfies every instinct of a good machinist. These and other production advantages . . . needed more today than ever before . . . are fully illustrated and completely described in separate specifications for each of the No. 2 Universal, No. 2 Plain, and No. 2 Vertical Light Type Milling Machines. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.



AMPLE RANGES OF SPEEDS AND FEEDS, quickly, easily selected. *Each selected by rotating a single lever, one turn in either direction, giving a change in rate. Large, easily read figures on dials indicate rates available.*

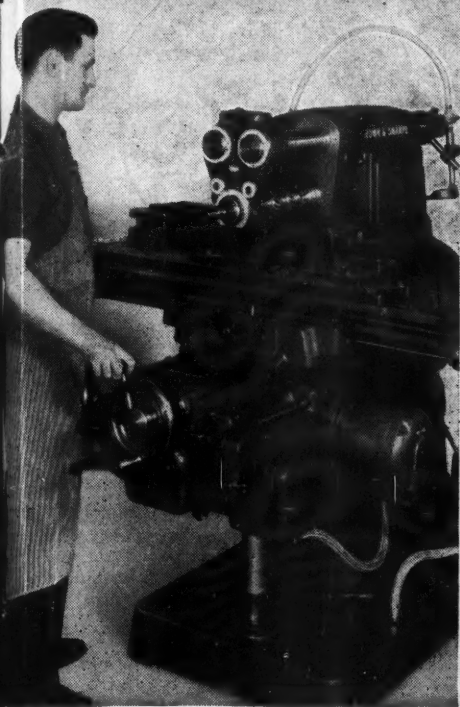
CONTROLS, naturally positioned . . . fatigue preventing . . . time saving. *Grouped for convenient reach and normal hand and arm movements at the front.*

UNIVERSAL

BROWN & S

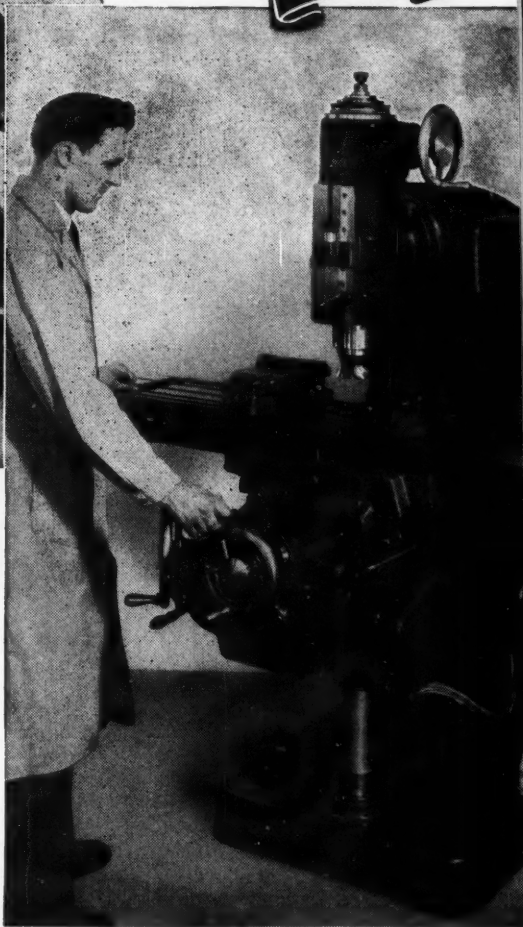
PLAIN

VERTICAL



SET-BACK FACE OF COLUMN provides greater rigidity of cutter support on the Universal and Plain Machines *which permits the cutter to be mounted closer to the spindle nose and allows the use of shorter arbors—a condition essential to maximum cutter rigidity under working loads.*

AUTOMATIC LUBRICATION. Throughout the column, knee and table, all driving mechanisms and ways have complete automatic lubrication. This saves the operator's time and greatly prolongs the life of the machine.



SHARPE



ANCHOR!

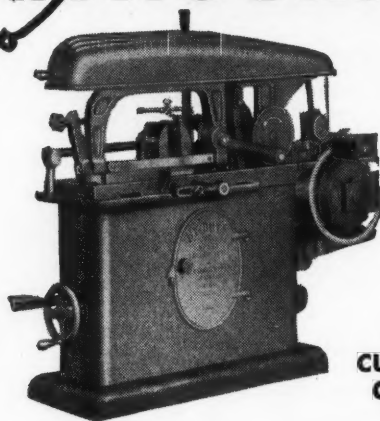
Zooming

MAN HOURS

To

ECONOMY

WITH



CUT
CUTTING
COSTS

KELLER Power Hack Saws!

Anchor Zooming man hours to production Economy. — Today's rising cost of man hours places greater emphasis than ever before on the savings which new modern machinery will give you.

KELLER POWER HACK SAWS will give you greater production economy through dependable trouble free cutting.

KELLER POWER HACK SAWS are built in several models. All engineered to handle the maximum quantity of stock, within their capacity, at any desired angle of cut, with the greatest possible convenience to the operator. Write to Dept. M-2 for catalogue, prices and complete specifications.

Sales Service Machine Tool Co.

2363 UNIVERSITY AVE.

ST. PAUL 4, MINNESOTA

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Type—
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furn
Painte
Weight

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Pro

Save production time with a **SHOPLIFTER**

- **Light, Compact**
- **Easily Moved About**
- **One-Man Operated**
- **Wide Range in Application**
- **Saves Production Time**
In handling dies and heavy fixtures; stacking barrels, boxes, etc.; loading and unloading trucks

Specifications

Type—D

Capacity—500 lbs.

Overall height—72"

Platform lift—54" above floor level, lowers to within 5" of floor

Baseframe—24" wide x 33" long

Platform—24" x 24", steel plate

Entire frame of machine of structural steel, electrically arc welded throughout

Basewheels—4" diameter, iron wheels

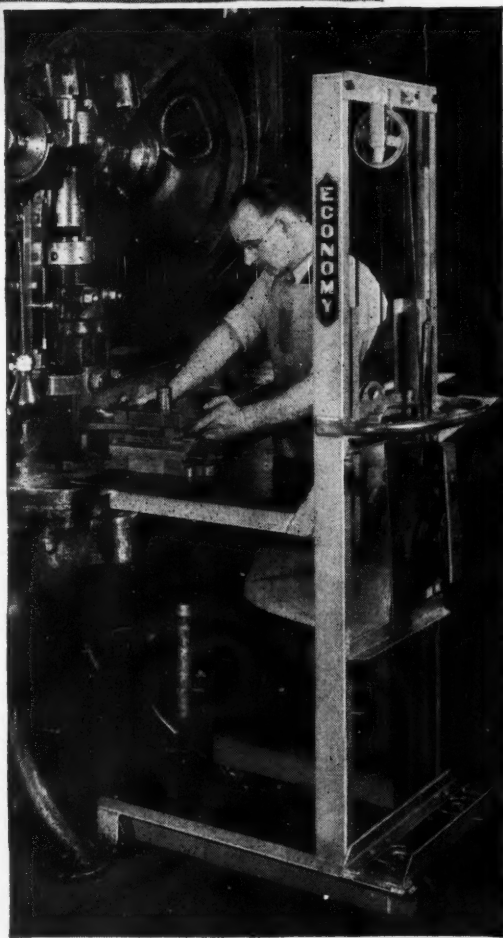
Crank up and down hoist unit

Two swivel casters and two stationary wheels with push bar furnished

Painted olive green finish

Weight—250 lbs. (approx.)

Heavier capacities up to 5,000 lbs. also available. Write for details.



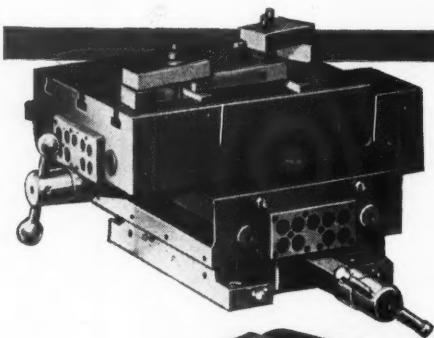
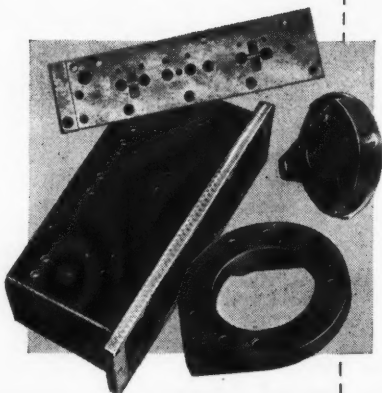
Prompt Delivery . . . Price \$157.50 Full freight allowed

Foot Operated Floor Lock—\$10.00 extra

ECONOMY ENGINEERING CO., 2637 W. Van Buren St., Chicago 12, Illinois

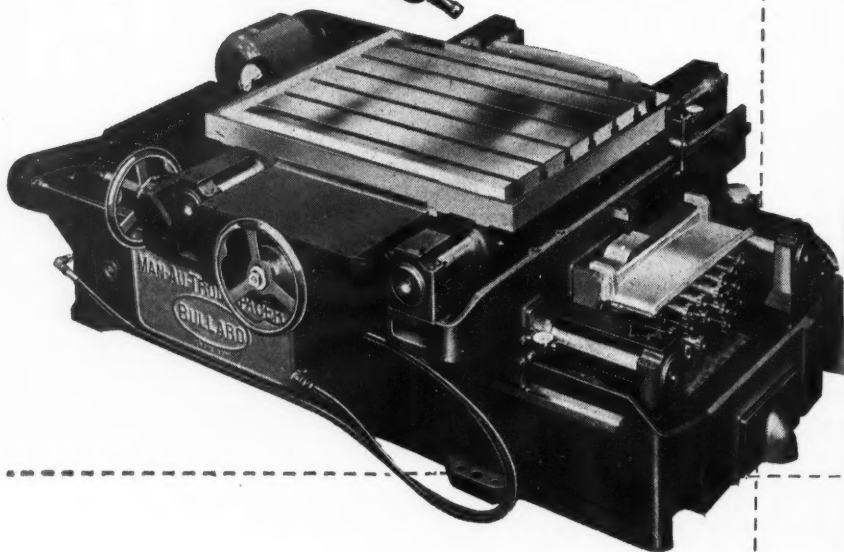
**Now...you can
drill, bore, ream or
tap pieces like these**

Actual work produced by Bullard
MAN-AU-TROL Spacers without the
use of jigs.



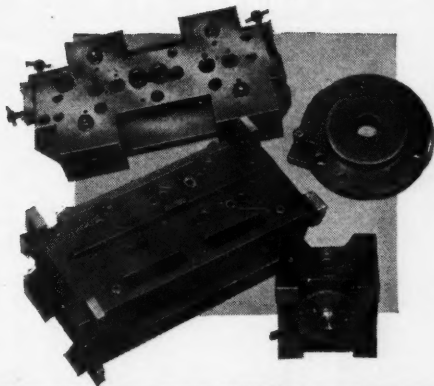
**...with Bullard
Man-Au-Trol Spacers**

4" x 4" Spacer for use with smaller
sensitive drills. 30" x 20" Spacer
for use with radial drills.



...and eliminate jigs like these

These cumbersome, costly jigs were formerly used to produce the pieces shown on the left.



New Bullard Man-Au-Trol Spacers Speed Production... Reduce Costs

With these semi-automatic positioning tables replacing most of your hole-locating jigs, men and machines that used to be tied up on jig fabrication can join your production line.

With the cost of designing, making, handling, repairing and storing jigs just about eliminated, your competitive position takes a turn for the better.

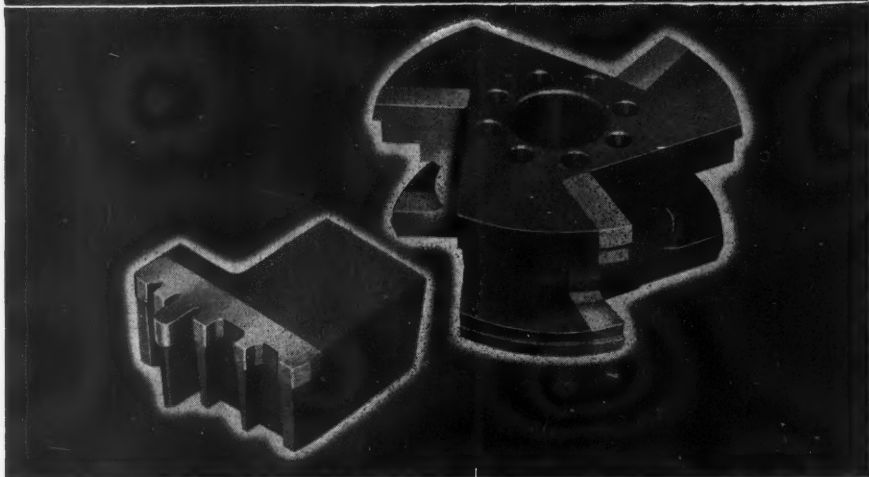
All the details about the way this *New Bullard Method* repeats any pattern of holes to speed production, reduce manufacturing costs, lessen operator fatigue, are contained in the new MAN-AU-TROL Spacer Bulletin.

Write for a copy today. The Bullard Company, Bridgeport 2, Connecticut.



CREATES NEW METHODS TO MAKE MACHINES DO MORE

YESTERDAY'S PIONEER . . . TODAY'S LEADER



WELDON Carbide Form Tools *Flat or Circular*

Fully equipped with the most recent developments in carbide grinding machinery, Weldon is able to produce a practically unlimited range of complicated shapes in flat or circular form tools to special order.

Send us your specifications

THE WELDON TOOL CO.



3000 WOODHILL ROAD

*Cleveland 4,
Ohio*

THE DRILL WITH A HUNDRED AND ONE SPEEDS

4 SPINDLE M96
RIGHT HAND
SPINDLE
POWER FEED

**ALL SPEEDS
INSTANTLY
AVAILABLE**

WHILE MACHINE
IS RUNNING

TWO MODELS

M96 — $\frac{7}{8}$ CAP.

M125 — $\frac{3}{8}$ CAP.

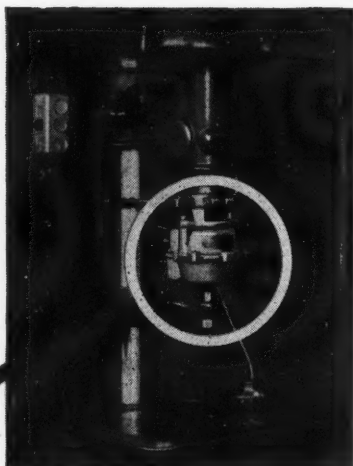
BOTH PRECISION
BALL BEARING

SEND FOR CIRCULAR.

THE TAYLOR & FENN CO. HARTFORD 1, CONN.



**Turn Out Fast
Accurate Tapping
Right On Your
Drill Press!**



— DO IT WITH AN

Ettco-Emrick

TAPPING ATTACHMENT

Just as quickly as it takes to slip one of these relatively inexpensive tapping attachments into the spindle, you can tool up your drill press to handle any production tapping job within the range of No. 0 to 1" taps.

Ettco-Emrick Tapping Attachments fit into any drill press just like any other shank tool. No alterations are necessary. And once you are set up, you can turn out work at highest practical tapping speeds with full protection against work spoilage and tap breakage.

WRITE FOR BULLETIN No. 2

It gives the full story and specifications of Ettco-Emrick Tapping Attachments.

ETTCO TOOL CO.

598 Johnson Ave., Brooklyn 6, N. Y.

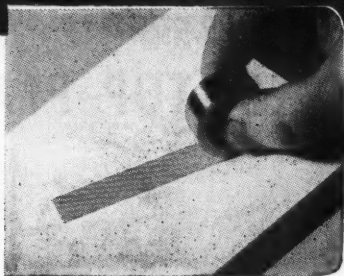
Detroit 1



Chicago 6

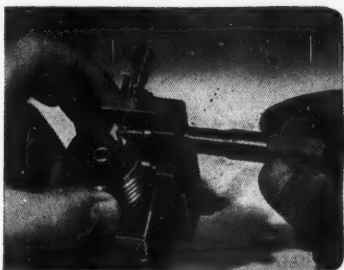
Over 25 years specialization in solving industrial drilling and tapping problems

Why Circular Chasers *Cut Costs*



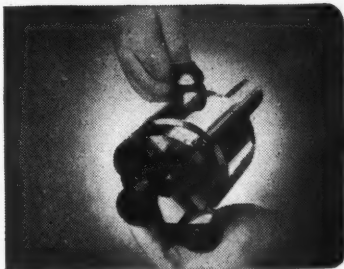
1 MORE CUTTING EDGE

Namco ground thread circular chasers may be reground through 270° of circumference—4 to 10 times more actual thread-cutting life than you can get with any other type of chaser.



2 PRECISION SHARPENING

Chasers, mounted on blocks, are checked for precision on the Namco Micrometer Gauge. It tells you how much to grind off, and rechecks accuracy after grinding. Eliminates all chance of variation, and speeds up the regrounding operation. Saves production time by permitting settings to be made in the toolroom.



3 FASTER REPLACEMENT

Lift handle to remove chasers—no screws to turn and no adjustments to make. You can keep a set of reground chasers ready and make the replacement in one minute, without disturbing the work. Then, the first piece turned is *production*—no cutting and trying necessary. Catalog D-42-C gives you all details.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Checking Automatics:
1-4-S and 8 Spindle • Hydraulic Thread
Rolling Machines • Automatic Threading Dies
and Taps • The Chronolog • Limit Motor Starter
and Control Station Switches • Solenoids
Couplings • Contract Manufacturing



ELECTRO-MAGNETIC KNIFE BAR

with the exclusive
LAMINATED* TOP PLATE



*Pat. Pend.

**HANCHETT Leads the Field
Again With a Chuck That
Holds Knives "Where It Counts" . . .**

Another first in efficient magnetic work holding, this new knife bar will give you 22% more work area . . . enable you to hold knives firmly to the extreme edges of the chuck . . . resulting in better accuracy, more production.

It's ideal, too, for grinding many small pieces at an angle, the all-steel top plate giving more uniform distribution of holding power.

Two types available — an inexpensive bar without T-slots and the standard type.

**WRITE TODAY. Get the details on this new chuck
and Hanchett's full line of Magnetic Chucking
Equipment. Ask for bulletin 045-Mb.**



HANCHETT MFG. CO.

MAGNETIC CHUCK DIVISION

BIG RAPIDS

MICHIGAN

CLECO TOOLS

for
TODAY'S JOB
and
TOMORROW'S



ROTARY GRINDERS

Ruggedly built, extra powerful. Many sizes, with straight or spade handles. Bulletin 80.



RIVETING HAMMERS

For heavy duty work with hot rivets. Three styles of handles. Bulletin 82.



RIVET BUSTER

To cut off rivet heads, break down walls, drive spikes and small drift bolts. Bulletin 83.



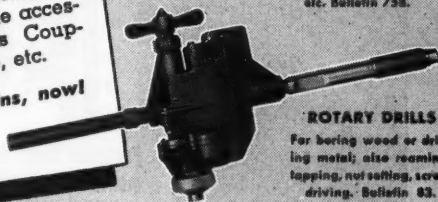
WIRE BRUSHING TOOLS

Husky rotary machines, used with radial wire brushes or cup wire brushes. Bulletin 80.



SCALING TOOLS

Handy hammers for cleaning paint, weld splash, scale from metal surfaces, etc. Bulletin 738.



ROTARY DRILLS

For boring wood or drilling metal; also reaming, tapping, nut setting, screw driving. Bulletin 83.



HAMMERS

For back fill tamping of earth excavations, and for ramming in the foundry. Bulletin 76B.

• Whether your needs are immediate, or for production scheduled for later delivery, you should know about these useful Cleco tools. The complete Cleco line offers the right tool for many major operations. Fast workers, that take it easy on air consumption, Cleco Tools are the product of over 50 years experience in this field . . . All the accessories, too—Bowes Couplings, valves, hose, etc.

Write for Bulletins, now!

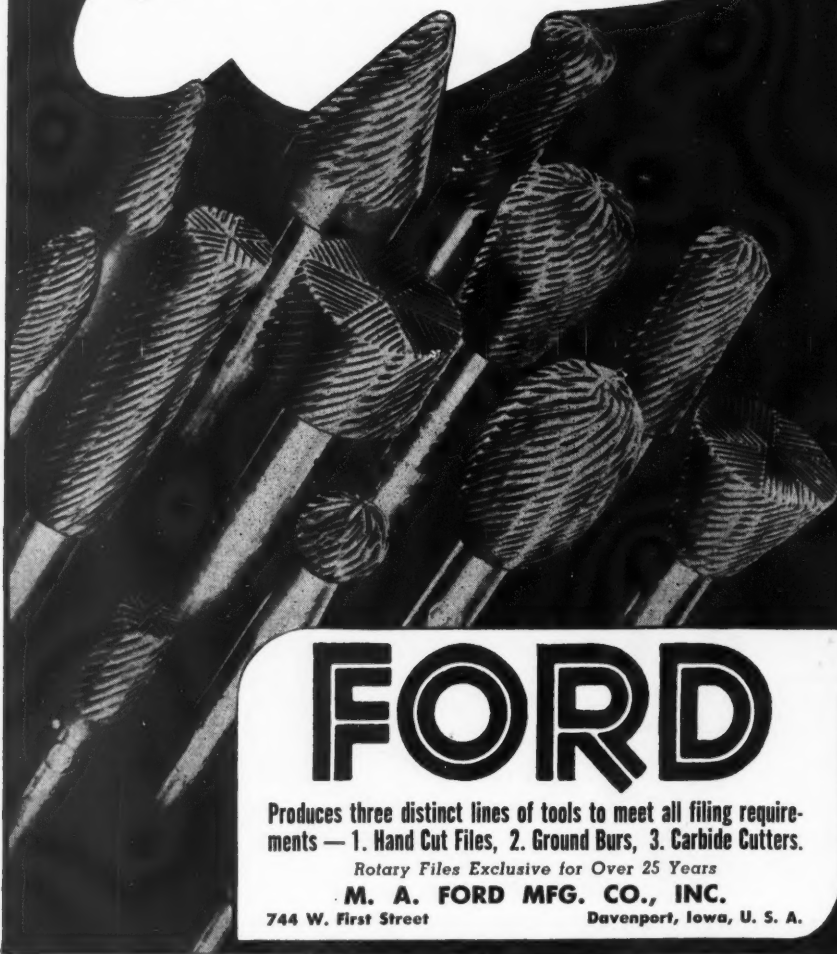
THE CLEVELAND PNEUMATIC TOOL CO.

3781 EAST 77TH STREET

CLEVELAND 5, OHIO

Distributors in all Principal Cities

THE RIGHT FILE
for the right job!



FORD

Produces three distinct lines of tools to meet all filing requirements — 1. Hand Cut Files, 2. Ground Burs, 3. Carbide Cutters.

Rotary Files Exclusive for Over 25 Years

M. A. FORD MFG. CO., INC.

744 W. First Street

Davenport, Iowa, U. S. A.

*Cro

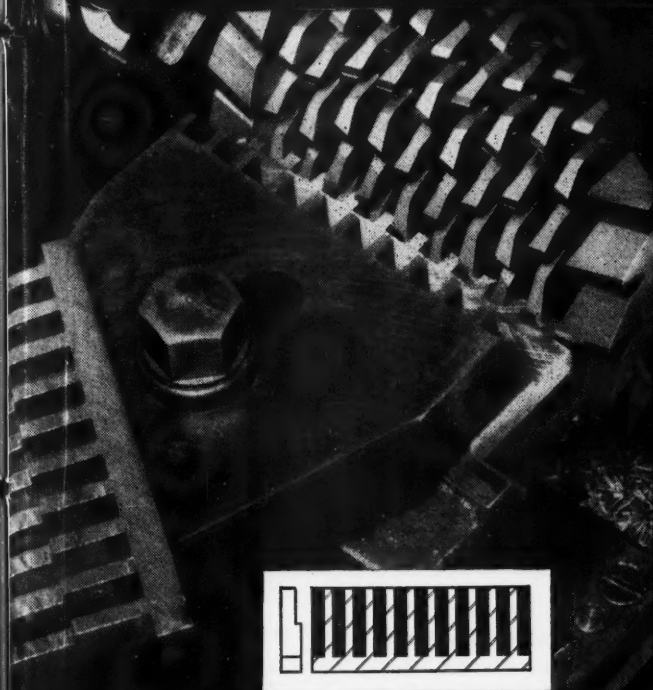
● In
wide
a ga
cutte
area
comp

TH
ing c
faster
Brow

BS

5½ square inches of steel removed
at one pass of these cutters

... THAT'S CUTTING CUTTER COST

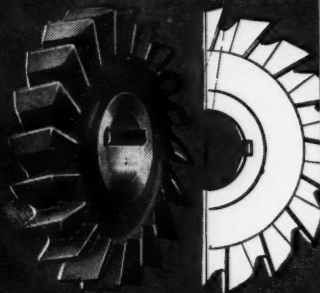


**Cross-section area of metal removed.*

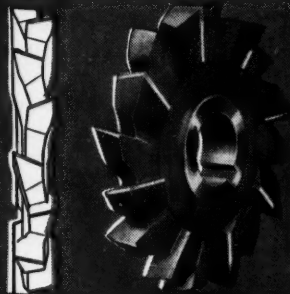
● In the job above, nine slots $\frac{5}{16}$ " wide and two end cuts $\frac{9}{32}$ " wide . . . all $1\frac{1}{16}$ " deep . . . are being milled simultaneously by a gang of nine staggered tooth and two half side milling cutters. That's removing 5½ square inches (in cross-section area) of low carbon steel at a single pass. These cutters are completing ten pieces per hour.

There's a good reason for preferring Brown & Sharpe milling cutters. They cut more metal per sharpening and cut it faster . . . all of which gives the lowest real cutter cost. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

B&S *We urge buying through the Distributor*



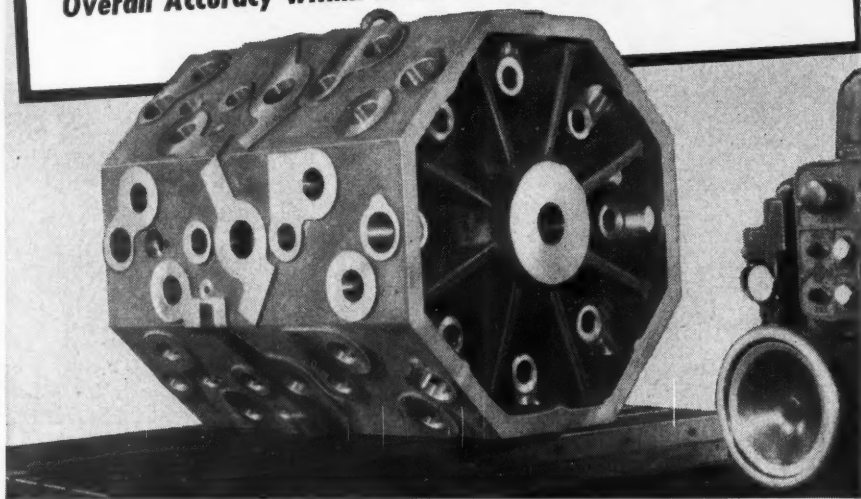
Half Side Milling Cutters . . .
used in straddle milling or cutting slots where complete bottom finish is not needed.



Staggered Tooth Side Milling Cutters . . . The alternate spiral angles of the teeth and the angle of undercut enable these cutters to remove large amounts of metal without destructive vibration or chatter. Deep cuts are made with good finish. Also used in making shallow cuts where depths must be varied.

BROWN & SHARPE CUTTERS

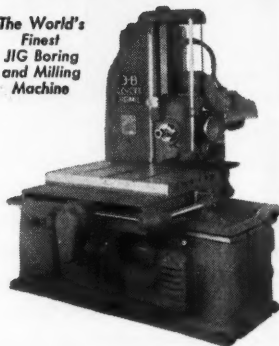
Milled and Bored Complete by means of
JIGMIL *Push Button Controls!*
 Overall Accuracy within .0005"! Floor-to-Floor in 75 Hrs.!



THE large trunnion shown above is typical of the "tough" jobs made easy by 3-B DeVlieg JIGMIL push button controls. Handled by a small, enterprising Detroit machine shop, its 8 faces and 2 ends ... plus the combined total of 140 holes ... were milled and bored complete on the JIGMIL to an overall accuracy within .0005"! Total floor-to-floor time: 75 hours!

This is a good example of the outstanding precision performance made possible through 3-B DeVlieg JIGMIL push button controls. Complete technical literature describing JIGMIL design, construction and operation is available upon request. Write for your copy today!

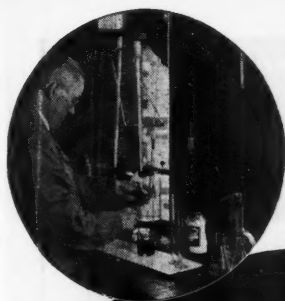
The World's
 Finest
 JIG Boring
 and Milling
 Machine



DEVLIEG MACHINE COMPANY



**450 FAIR AVE. FERNDAL 20,
 (Detroit) MICH.**



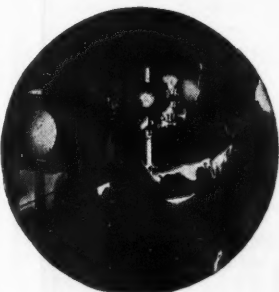
Rigid
MANUFACTURING
Controls

assure unsurpassed
performance of

BUCKEYE BEARINGS

● Use of selected metals, and our exacting control of charging ratios, and melting and pouring temperatures, assure the production of uniformly high quality bearings. Each piece, month after month, measures up fully to our rigid specifications.

For easy assembly, and long, efficient, satisfactory service, specify Buckeye Bearings by brand name. Available in 1088 fully finished ready-to-use stock sizes—in cored and solid 13" bars—in several graphited styles—also in any ID, OD and length; slotted, split, drilled or flanged exactly to your special blue-print requirements. No order is too big or too small for Buckeye. Let us quote on your requirements.



Buckeye

BRASS AND MANUFACTURING COMPANY

6412 HAWTHORNE AVE.

BRONZESMITHS

SINCE 1900

CLEVELAND 3, OHIO



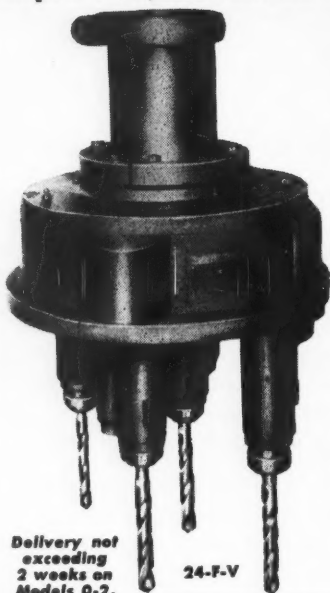
BRONZE SLEEVE BEARINGS • STANDARD SIZES OR TO CUSTOMERS' BLUEPRINT
IN ANY RECOGNIZED BEARING METAL ANALYSIS

BUHR

ANNOUNCES SUPERIZED
BALL BEARING
ADJUSTABLE TYPE

DRILL HEADS

Improved Construction Induction Hardened Shaved Gears



Delivery not
exceeding
2 weeks on
Models 0-2,
0-3, 12, 13,
14, and 18.

24-F-V

Buhr adjustable heads have been used economically for intermittent set ups on short orders and large production jobs. They are made in sizes and number of spindles to fit any ordinary layout of holes. Buhr ball bearing heads have been the pioneers in ball bearing construction and shaved gears. Adapters are separate and are interchangeable from one press to another. They are so constructed the operator can quickly set the head in any desired radial position to suit drill jig and drill press quill.

The 24-FV Head shown has 4 spindles, maximum drill size $\frac{3}{4}$ "—minimum distance between spindles $2\frac{1}{2}$ ". Diameter of circle adjustment, minimum $3\frac{5}{8}$ "—maximum $15\frac{1}{2}$ ". Heads self contained and all parts are running in light oil.

HIGH PRODUCTION MULTIPLE SPINDLE MACHINES FOR
Drilling — Reaming — Tapping — Countersinking — Spot Facing.
Fixed Center and Adjustable — Multiple Drilling and Tapping Heads.
Index Tables — Jigs — Fixtures.

BUHR

Machine Tool Co.

845 GREEN ST.

ANN ARBOR, MICH.



**A CHAIN IS
AS STRONG AS
ITS WEAKEST
LINK**

**A MACHINE IS
AS GOOD AS ITS
CUTTING TOOL...**

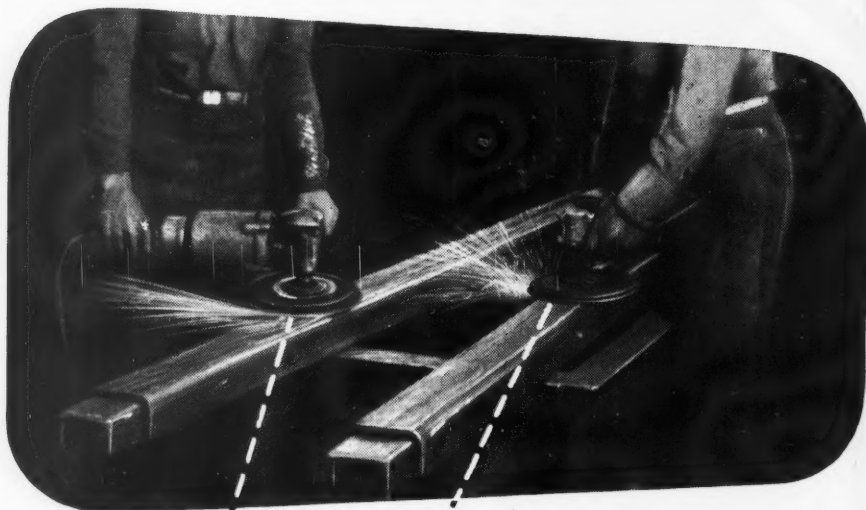
***Specify*
CONTINENTAL**

The precision cutting tool must be even more accurate than the machine, the fixture, or the finished part. "Continental" cutting tools made by Ex-Cell-O (they run from a standard counterbore to all types of broaches and to special carbide-tipped tools of intricate design) are acknowledged to be among the best obtainable in design and manufacture and in actual production results.

CONTINENTAL TOOL WORKS
DIVISION OF EX-CELL-O CORPORATION
DETROIT 6, MICHIGAN

another job
DONE RIGHT

with an **ARMOURCLAD** resin fibre disc



WHATEVER YOUR PRODUCTS OR
SPECIALIZED NEEDS...one of Armour's
complete line of better metal-working
abrasives is *right for you!*



ARMOUR
Sandpaper
WORKS

Division of Armour and Company

1355 West 31st Street • Chicago 9, Illinois

Export: Durex, 63 Wall Street, New York 5, N. Y.



CP-3010 Pneumatic Die Grinder, equipped with tungsten carbide rotary file, being used for high-speed burring of steel castings.

CUT YOUR BURRING COSTS with Rotary Files

Chicago Pneumatic's wide range of small pneumatic grinders includes tools of ample power and speed for all types of rotary file work. Small, light, compact design provides perfect balance. Rotary operation insures a smooth, vibrationless flow of power. CP rotary air motors always run cool, and cannot be harmed by overloading.

Invaluable for a multiplicity of uses, tools are furnished with numerous handle and throttle designs, as well as spindle extensions

and adapters, to meet specific requirements.

Made in over-all lengths of 5 $\frac{7}{8}$ ", 9" and 12 $\frac{1}{4}$ "; they can also be furnished with 14" and 27" extension spindles. Wheel capacities up to 2 $\frac{1}{2}$ " in diameter. Weights: 1 $\frac{1}{4}$, 3 and 3 $\frac{1}{2}$ pounds.

These versatile rotary tools can also be used with drills, steel cutters, mounted points, wire wheels, polishers, and other attachments.

Write for complete information on CP pneumatic grinders.



**CHICAGO PNEUMATIC
TOOL COMPANY**

General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

CRITERION *Boring* HEADS

RIGID



Smooth

COMPACT

Highly favored by operators because of their smooth, rigid, compact design. Particularly adapted to the use of carbide tools. Adjusting screw ground from solid AFTER hardening. Gradu-

ated in thousandths, widely spaced, easily read. Criterion Boring Heads are sold throughout the U.S. Order from your dealer. Request free literature.



WRITE: ATTENTION DEPT. A.

C RITERION MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

THE HOLE STORY . . .

fast

The new No. 212 Bryant Automatic Internal Grinder roughs and *truez* and finishes and stops automatically. It requires a minimum of operator attention. It has 9" maximum swing — 3" grinding traverse — 12" total wheel traverse.

The wheelhead shown is the Bryant Hi-Frequency direct drive motor built to operate at speeds up to 100,000 R.P.M. The wheelhead is carried on a hardened and ground cylindrical slide.

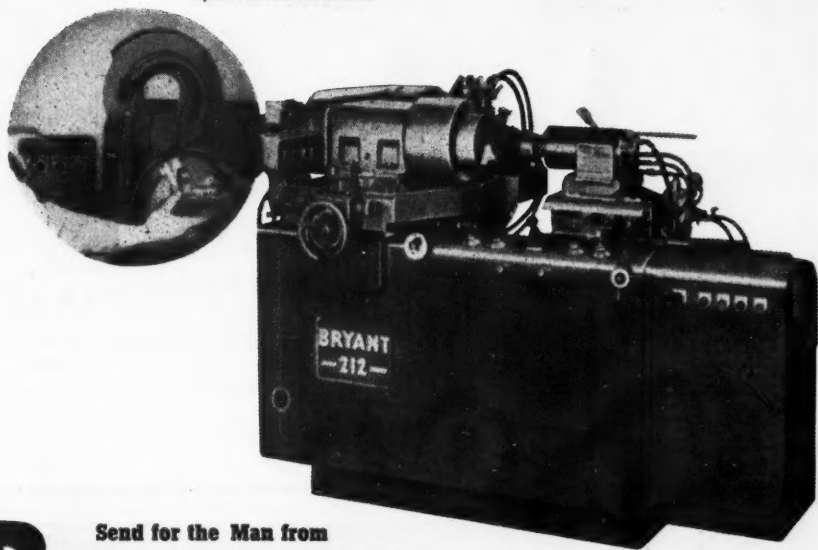
The cross-feed is in the work table which rides on anti-friction bearings and is controlled by a precision lead screw. The work spindle is mounted in preloaded ball bearings and is dynamically balanced to assure precision work.

An electrically controlled hydraulic system provides smooth operation and simple cycle change.

Automatic work sizing is accomplished by any of three methods: by a plug gage mounted in the work spindle; by a diamond contacting the bore; by the wheel truing diamond.

Operator attention is further minimized by such features as convenient grouping of simplified controls and automatic pressure lubrication.

For a better product and a better profit, ask for further information on the Bryant No. 212 Automatic.



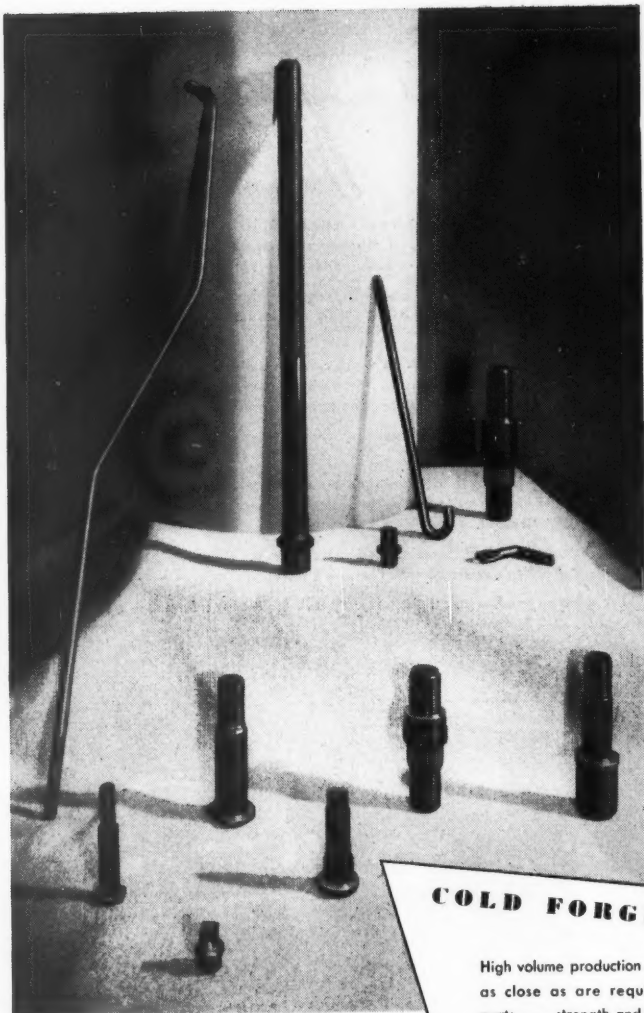
Send for the Man from

BRYANT



BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.



Allied
WITH MASS
PRODUCTION

COLD FORGED PARTS

High volume production at low cost . . . tolerances as close as are required for most machined parts . . . strength and durability . . . "on time" delivery . . . are guaranteed by Allied's experience in producing cold forged parts. Quotations figured from your part prints will be submitted promptly.

**ALLIED PRODUCTS
CORPORATION**

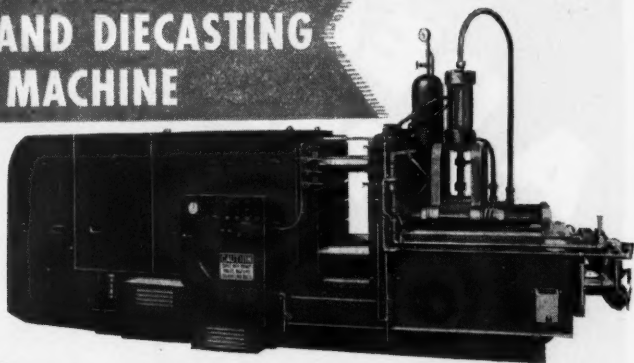
DEPARTMENT 32

4624 Lawton Ave., Detroit 8, Mich.

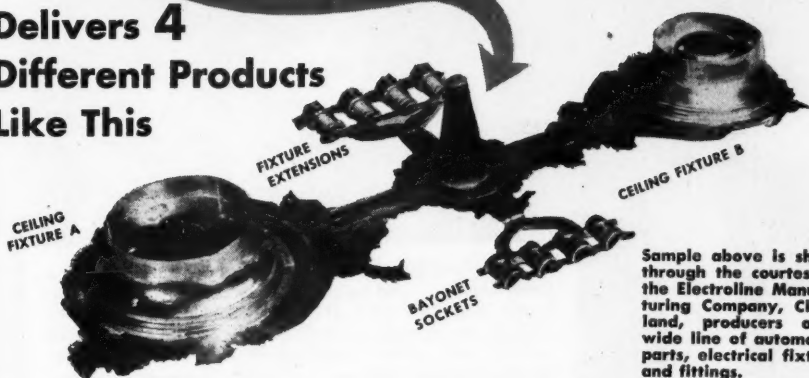
SPECIAL COLD FORGED PARTS • STANDARD CAP SCREWS • HARDENED AND PRECISION GROUND PARTS
SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST • JIGS • FIXTURES • STEAM-HEATED PLASTIC MOLDS
SPECIAL PRODUCTION TOOLS • R-B INTERCHANGEABLE PUNCHES AND DIES • DIE MAKERS' SUPPLIES

ONE SHOT

on this
**CLEVELAND DIECASTING
MACHINE**



**Delivers 4
Different Products
Like This**



Sample above is shown through the courtesy of the Electroline Manufacturing Company, Cleveland, producers of a wide line of automotive parts, electrical fixtures and fittings.

Using a new type four-gate divided die, which has the added advantage of permitting combinations of varying quantity requirements. When one short run item is completed a section of the die can be detached from the master die, another inserted and production resumed. By maintaining a variety of sections matched to the master die it is easy to schedule flexible and economical production of a wide variety of high grade die castings. Let us show you further evidence of the economy of production with Cleveland Die Casting Machines.

THE CLEVELAND AUTOMATIC MACHINE CO.

4940 BEECH STREET

CINCINNATI 12, OHIO

BRANCHES: Cleveland

• Chicago

• Detroit

• New York

• Hartford

A REAL HE-MAN JOB!



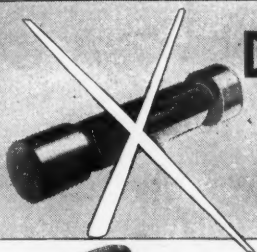
**BAY
STATE**

Both man and grinding wheel on this snagging job must be plenty tough . . . and toughness is one of the features scientifically "built" into BAY STATE SNAGGING WHEELS AND CONES. This rugged quality is not all. BAY STATE'S special resinoid and vitrified bonds assure faster, cleaner, stock-removing action, resulting in a definite increased economy. Our unique method of rigidly imbedding the steel nut, on the taper cup shapes, is an added safety factor.

Detailed snagging wheel bulletins . . . either portable snagging or for heavy swing frame and floor stand grinders are yours for the asking.

Top Performance Consistently Duplicated

BAY STATE ABRASIVE PRODUCTS CO. • WESTBORO, MASSACHUSETTS, U.S.A.



DuBo Gages are going over!

Orders and re-orders demonstrate DuBo superiority over cylindrical plug gages



* DuBo Plug Gage

checks bores **FASTER,**
more accurately!

Enthusiastic users all over the country are rapidly replacing cylindrical plug gages with DuBo Gages. The first use unmistakably demonstrates DuBo superiority — its extreme lightness, its ability to detect dimensional deviations (taper and out-of-roundness), its ease, speed and accuracy. STANDARD representatives in leading industrial centers will gladly arrange a demonstration for YOU.

WRITE FOR BULLETIN

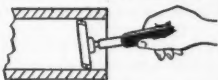
*Patents Pending

LIGHT IN WEIGHT



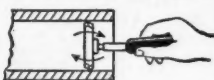
DuBo Gages weigh 70% to 80% less than cylindrical plug gages of equivalent size. Lighter weight means less fatigue, greater accuracy.

EASY TO ENTER



DuBo is entered easily by tipping handle slightly above bore axis (no jockeying necessary). Enters even under-sized bores easily.

DEFINITE CHECK



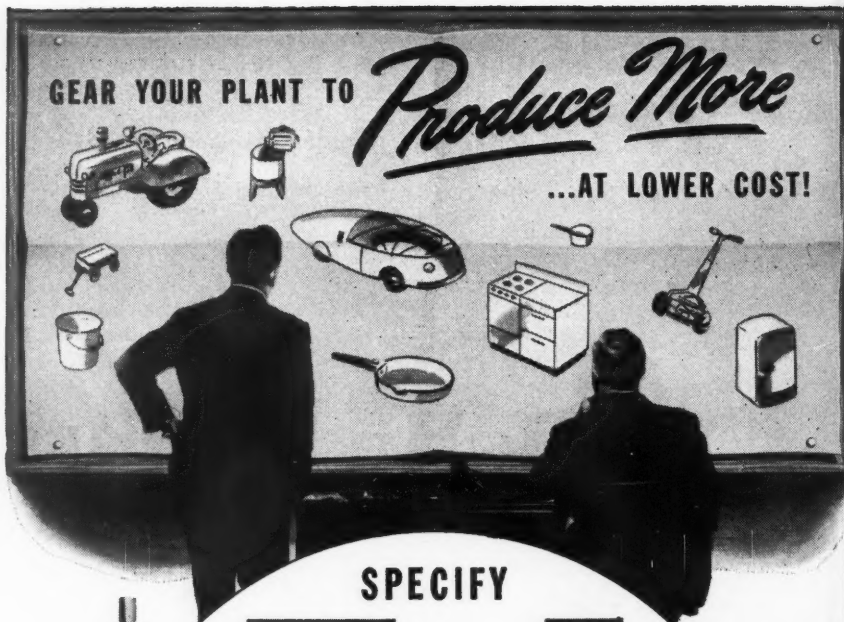
Enter gage, rock handle gently, bringing spherical gaging surface in contact with bore wall. Whether or not handle drops freely below center, is definite yes-or-no answer.

STANDARD GAGE CO., INC., Poughkeepsie, N.Y.

GEAR YOUR PLANT TO

Produce More

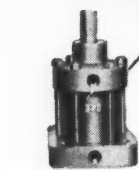
...AT LOWER COST!



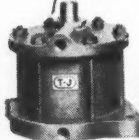
SPECIFY

T-J

for Tough Jobs!



HYDRAULIC CYLINDERS



AIR CYLINDERS



CLINCHORS



CUTTERS



AIR CONTROLS



RIVITORS

T-J Performance is helping plants throughout industry handle tough jobs at *top-speed* and *efficiency*... with *lower costs*!

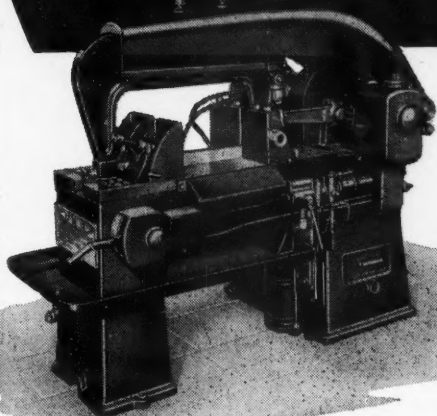
Right now in your plant—there may be many jobs that T-J Products can perform faster and better. Check your needs for air cylinders... hydraulic cylinders... Rivitors... cutters... Clinchors... or air controls—these are products that T-J builds with ahead-of-the-times features! Backed by more than a quarter of a century's experience... T-J engineered and precision-built for utmost *accuracy* and *dependability*. Write for bulletins. The Tomkins-Johnson Co., Jackson, Mich.

TOMKINS-JOHNSON

RIVITORS, AIR AND HYDRAULIC CYLINDERS, CUTTERS, CLINCHORS



5 reasons why YOU SHOULD USE RACINE MACHINES



- 1 **EASY OPERATION** — a single lever at the operator's fingertips controls all operating functions.
- 2 **OPEN FRONT** — quick, easy loading, special fixtures readily placed.
- 3 **CORRECT PRINCIPLE** — progressive feed throughout cutting stroke insures maximum depth of cut.
- 4 **EXTRA POWER** — hydraulic system more than adequate to handle any overload.
- 5 **ECONOMICAL OPERATION** — the few moving parts are extra heavy and rugged, no failures here.

FOR ALL YOUR METAL CUTTING WORK

Before you mill, drill, bore or grind a part made of metal, you must cut it off. Current, late model Racine Machines will "cut your cutting costs." All of them employ thin blades progressively applied. They are fast and accurate, save time and material.

Hydraulic feed and pressure provide a smooth, oil-cushioned cutting action. The blade cuts deep, taking out long, thin, curled chips. Power requirements are low. True faces reduce subsequent machining operations and eliminate waste of stock.

These modern machines are available in all capacities from 6" x 6" to 20" x 20". Automatic bar-feed models produce multiple pieces like an automatic screw machine.

Get all the facts on this equipment for your maintenance, tool room and production metal cutting. Racine engineers and field service men will cheerfully submit studied recommendations. Write today for the latest data. RACINE TOOL & MACHINE COMPANY, 1770 State Street, Racine, Wis.



RACINE OIL HYDRAULIC PUMPS AND VALVES

For power movements in machines in your plant or in any of your products, investigate RACINE HYDRAULIC equipment. Variable Volume Oil Hydraulic Pumps to 30 G.P.M. capacity. Pressures to 1000 p.s.i. Also a complete line of Hydraulic Valves in all sizes from $\frac{3}{8}$ " to $1\frac{1}{2}$ ". Ask for Catalog P-10-C.

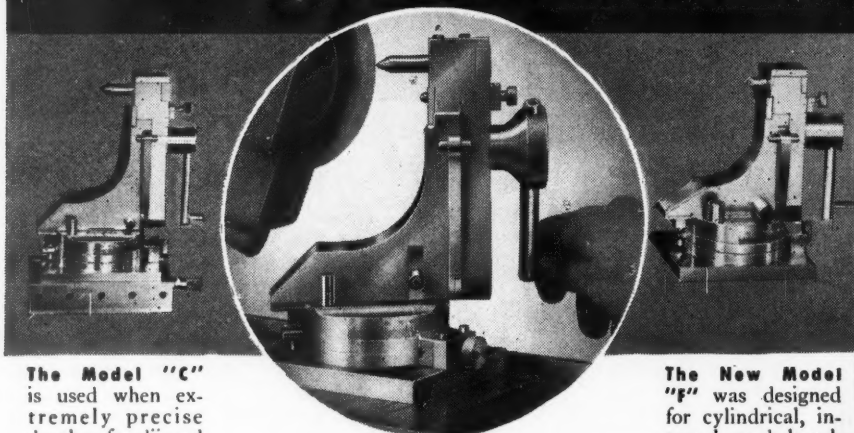


RACINE

STANDARD FOR QUALITY AND PRECISION

"Fluidmotion" Series

OF RADII & ANGLE DRESSERS HAS A MODEL
FOR MOST FORM DRESSING REQUIREMENTS



The Model "C" is used when extremely precise depths of radii and simple operation are required. It is essentially the Model "E", with a special base which moves the "E" forwards and backwards by means of a hardened and ground lead-screw. The lead-screw handle graduated to .001" moves the "E" on a straight line with a sensitive range of a full inch.

The Standard Model "E" is universal for production and the tool-room. The basic design, also used in Models "C" and "F", makes the "Fluidmotion" Series among the finest dressing instruments procurable—regardless of cost.

With only one setting "Fluidmotion"* blends two angles and a radius in one continuous motion that gives a clean form without tool or chatter marks. The Standard Model "E" is adaptable to both surface and cylindrical grinders.

Range of radii, concave or convex, 0 to 3". Angular travel, $2\frac{1}{4}$ ". Wheel capacity, 14". Height of diamond point from base, $7\frac{1}{2}$ ".

The New Model "F" was designed for cylindrical, internal, and bench surface grinders with wheel diameters under 7". Its compact size is ideal for cylindrical grinders with spindle heights as low as 5" from table base. All Model "E" features are included. Range of radii, 0 to $1\frac{1}{2}$ ". Angular travel, $1\frac{5}{8}$ ". Wheel capacity at full range, 6". Diamond height, 5".

EXCLUSIVE "Fluidmotion" FEATURES

- ★ .0001" accuracy
- ★ Automatic centering
- ★ "Fluidmotion" dressing
- ★ 7" to 14" wheel capacities
- ★ Dustproof and chatterless
- ★ Large range—yet compact

*REG. U. S. PAT. OFF.

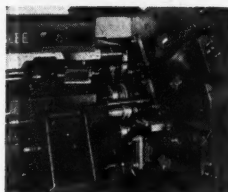
★ Hardened stainless steel

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J&S TOOL CO.

477 Main St., East Orange 5, N. J.
Representatives in Principal Cities

A TIME-**SAVING** FEATURE OF THE
GREENLEE "6"
 AUTOMATIC SCREW MACHINE



Pictures above show the location and arrangement of cross-slides on front and back of the GREENLEE "6". Arrows indicate the position and accessibility of identical tool cavities.

**STANDARD TOOL HOLDER BODIES
 ARE IDENTICAL—FIT ANY
 CROSS-SLIDE CAVITY**



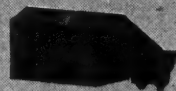
Hyper-Tool Tool Holder



Six-Type Tool Holder



Machine Power-Tool Holder



Cut-Out Tool Holder

INTERCHANGEABLE. All cross-slide tool cavities on the GREENLEE "6" are identical, and the bodies of all cross-slide tool holders are made to fit these cavities accurately. Tool holders may be used in any cavity and can be quickly and easily shifted from one position to another or from one machine to another.

TIME SAVING. This interchangeability of tool holders saves a substantial amount of time on set-ups because there is no hunting

around for special holders to fit certain positions and because tools coming off a job can often be quickly rearranged for the new job. Furthermore, fewer tool holders will be required, with a noticeable saving in tooling expense.

OTHER FEATURES. Get our new book "Greenlee Automatic Screw Machine" and read about the many other outstanding features that make this machine "The Operator's Favorite."



GREENLEE BROS. & CO.
 1882 MASON AVE., ROCKFORD, ILLINOIS

WRITE TODAY FOR MORE FACTS

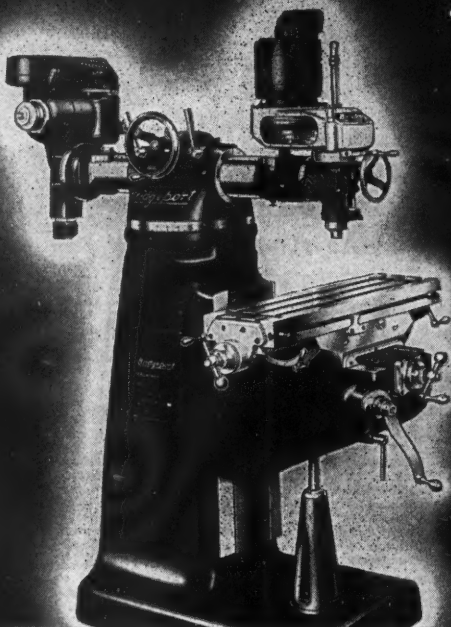
MULTIPLE SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

Bridgeport

TURRET MILLING MACHINE

THE BRIDGEPORT TURRET MILLING MACHINE has won universal acceptance. It has proved a most valuable time and labor saver in the tool rooms and production departments of the largest plants. Its wide range and versatility in milling, drilling, boring and shaping enable it to serve as the complete central machine around which all operations revolve in many small shops.

It will pay you to explore the possibilities of the "BRIDGEPORT" in your plant.



BRIDGEPORT MACHINES, INC.

52 REMER ST.

BRIDGEPORT, CONN.

**"LOW COST, LONG SERVICE,
SMALL MAINTENANCE"**
says *Maurer Supply Co.* about
CURTIS AIR HOISTS



The Maurer Supply Co., St. Louis, uses Curtis Air Hoists to raise and lower parts in hot-dip galvanizing work. Among other advantages, they have found that the rigid rod in Curtis hoists eliminates swinging; that the positive control of loads is essential to such work and provides a maximum of safety to the operators. Working under severe conditions of acids and heat, these Curtis Air Hoists are giving "trouble-free service" and enabling this company "to perform an operation impossible without them."

Curtis Air Hoists have a proven record of saving time and labor in many lifting, pushing or pulling operations. They offer:

Low first cost; lowest operating expense.

Smooth, fast, accurate control of loads.

Finger-tip control.

Light weight; cannot be overloaded.

Capacities up to 10 tons.

For complete information on Curtis Air Hoists, Air Cylinders and Air Compressors, write for Bulletin C-7.

**CURTIS PNEUMATIC
MACHINERY DIVISION**

of Curtis Manufacturing Company

1913 Kienlen Ave. St. Louis 20, Mo.

CURTIS PNEUMATIC MACHINERY DIVISION

H-530D

of Curtis Manufacturing Company

1913 Kienlen Avenue, St. Louis 20, Missouri

Please send me Form C-7 on Curtis Air Hoists, Air Cylinders and Curtis Air Compressors.

Name.....
Firm.....
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City..... Zone..... State.....

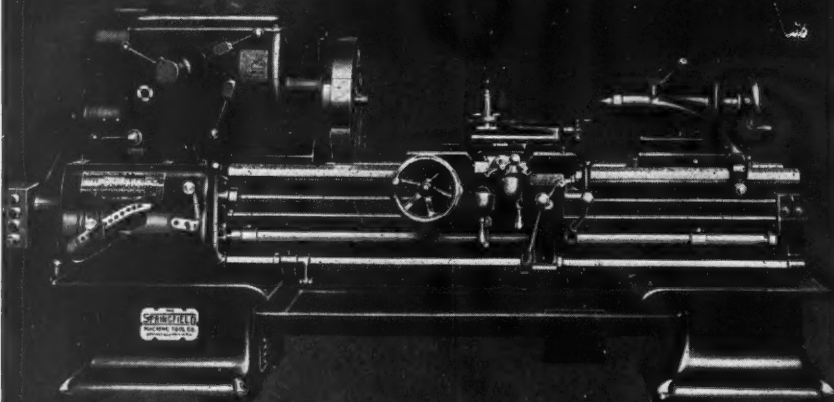
92 years of successful manufacturing

HEAVY DUTY
Springfield
GEARED HEAD
Lathes

Tool Room Lathes have lead screw reversing mechanism which produces right and left hand threads and feeds with automatic stops for both lead screw and feed rod.

Deep, well ribbed lathe bed of high test nickel chrome gray iron assures extreme accuracy and long life.

Ground gears and up-to-date oiling systems on all sizes. Write for Bulletin 162.



THE SPRINGFIELD MACHINE TOOL CO.
SPRINGFIELD • OHIO, U. S. A.

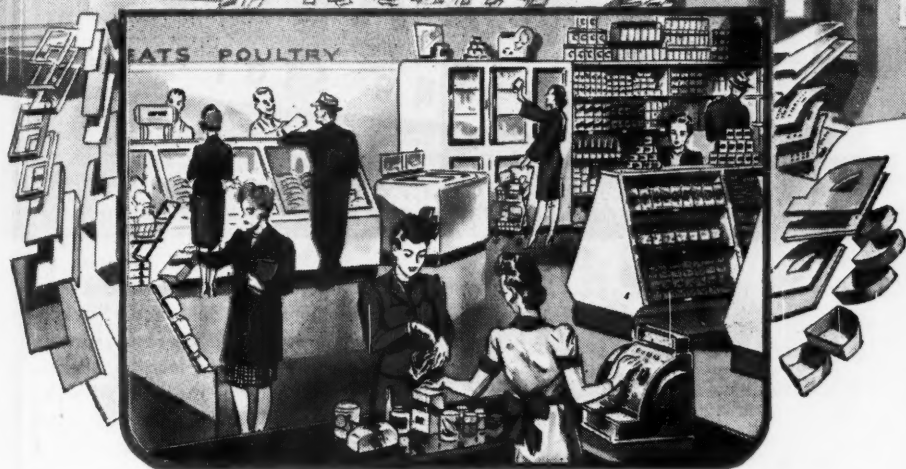
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EFFICIENT SELF SERVICE

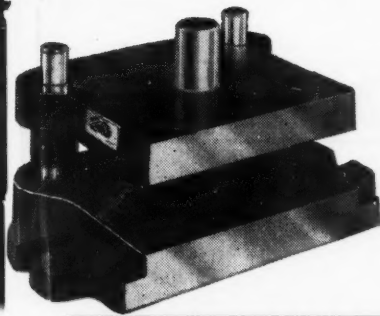


is a matter of Press Production

Modern merchandising owes much of its efficiency to a modern production method—*Press Production*. The Press is ideally suited to the production of panels for self-service refrigerators, display counters, shelving—the many duplicated parts in the mechanism of a tabulating cash register.

In the press departments and Stamping Plants of America, Danly Die Sets and Die Makers' Supplies are recognized as a necessary part of good presswork, because Danly means *known dependable accuracy*.

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue • Chicago 30, Illinois



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National Assembly

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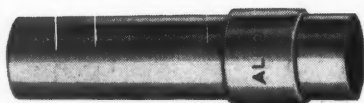
DIE MAKERS SUPPLIES

DANLY DIE SETS

Welded Steel Fabrication

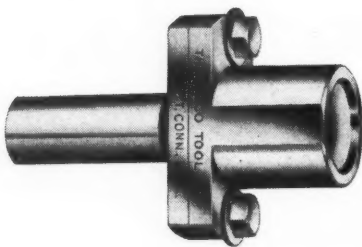
The New **ALCO** REVOLVING STOP

Economical • Rugged • Dirt Free

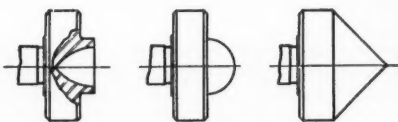


**ALCO
REVOLVING STOP**

Sealed bearings prevent chips and dirt from penetrating into the ball race. Smooth, free-running operation is the result, with no sticking. Retain accurate lengths with no marring of the ends of the work with this new and improved revolving stop. It costs less to use this efficient Alco stop than it would a home-made stationary stop.



**ALCO
COMBINATION
ROLLER STOP AND
SUPPORT**



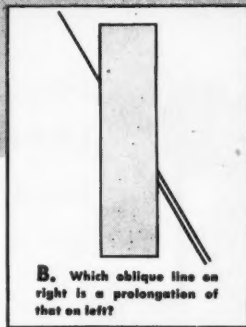
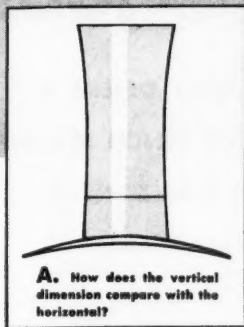
For long pieces or where very accurate forming operations call for absolute rigidity, this combination tool supports the work and revolves with it. There is no friction as with a stationary support, and interchangeable rotors can be furnished to fit any end shape.

SEND FOR CATALOG

ALCO EFFICIENT **TOOLS**

THE ALCO TOOL CO., 152 Birdseye Street, Bridgeport, Conn.
Chicago Office: 608 S. Dearborn St., Telephone WEBster 2868

How is Your "Eye Cue" on Measurements?



A surprising number of seasoned shop men discovered that eye cues to sizes are not always reliable. In several tests made recently, many failed to identify the correct size and thread pitch of the socket screw above. Ordinarily these men don't guess...they take the sure but slow way of gauging or "miking".

Now...they're sure at a glance...

WHEN IT'S SIZE-MARKED

This unique improvement appears on the head of every P-K Socket Head Cap Screw. It saves time by eliminating gauging or "miking" and removes every possibility of error.

At the tool crib, left-over mixed-up screws are quickly identified and replaced in the right bins. Correct sizes are issued to assembly line workers—speeding up their work. New help learns screw sizes faster—works faster.

AN EXTRA SALES FEATURE, TOO. Service men in the field recognize its time-saving advantages on re-assembly jobs.

PLUS ANOTHER IMPROVEMENT—GEAR GRIP*

This firm gripping surface prevents slips and slow-downs for fast fingers, even when oily. Only P-K offers Socket Head Cap Screws with both features. Write for samples, today. Parker-Kalon Corp., 200 Varick Street, New York 14, N. Y.

ANSWERS: A. The same B. The lower one
C. When it's P-K Size-Marked, there's never a question!

*U. S. PAT. No. 126,409

ANOTHER P-K FIRST! Ground Thread Socket Set Screws

• Threads are ground on pre-hardened stock by a newly developed centerless grinding method. The results... a smoother, brighter, cleaner finish, free from imperfections common to ordinary cut thread set screws; faultless thread contour and dependable Class 3 Fit. They look better... start better. Write for samples.

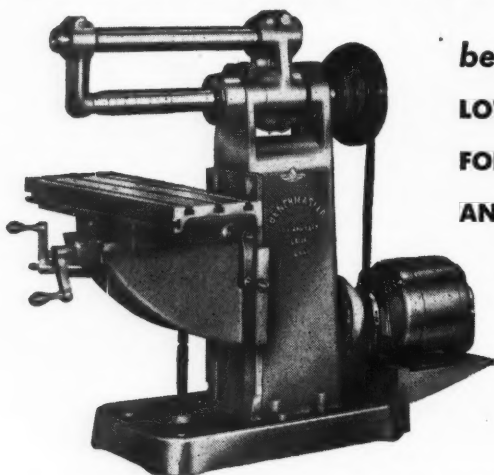
**P-K SOCKET SCREWS
ARE AVAILABLE FOR
PROMPT DELIVERIES**



SOLD ONLY THROUGH ACCREDITED DISTRIBUTORS

PARKER-KALON *Cold-Formed* **SOCKET SCREWS**

ONE *for* TWO jobs



**benchmaster OFFERS A
LOW-PRICED BENCH MACHINE
FOR BOTH HORIZONTAL
AND VERTICAL MILLING**

*benchmaster mill with
horizontal spindle overarm*

SAVES VALUABLE SPACE—CUTS DOWN EQUIPMENT COSTS

Now you can obtain a precision perfect, high-speed *benchmaster* milling machine that's easily convertible from a horizontal to a vertical miller by simply interchanging spindle attachments. Its *unusual* versatility, plus the *usual* quality-plus *benchmaster* workmanship, make this double-duty milling machine an outstanding addition to your shop.

SPECIFICATIONS: Table size—6"x 14"—Three Tee Slots $\frac{3}{8}$ ", 2" center Longitudinal travel $8\frac{1}{2}$ "—Traverse travel $5\frac{1}{2}$ "—Vertical travel $8\frac{1}{2}$ " on vertical mill— $9\frac{1}{2}$ " horizontal mill—Height 28"—Weight (less motor) 215 lbs.—Requires $\frac{1}{3}$ h.p. motor—Spindle speeds (standard 1725 rpm motor) 450-850-1400-2100 rpm.

For complete information write to Dept. MM-2.

benchmaster

MANUFACTURING COMPANY
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CONSTANT PRESSURE



SMOOTH POWER

NORGREN REGULATOR

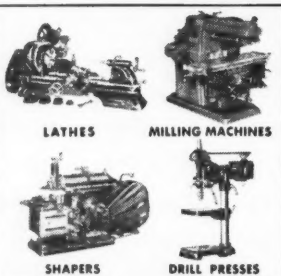
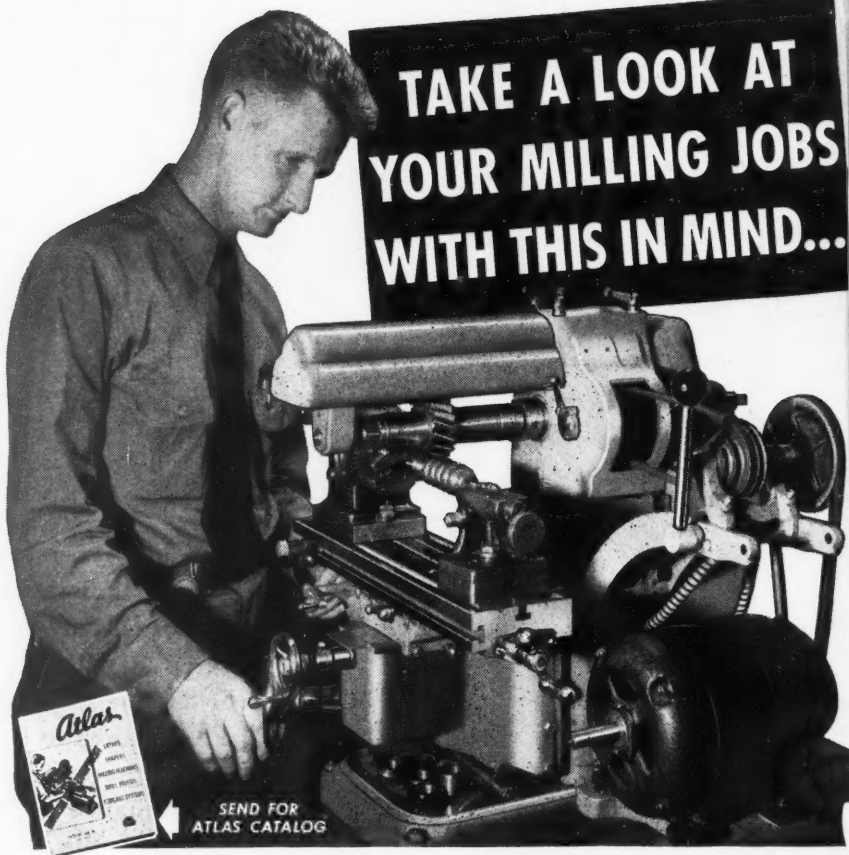
—**Floating diaphragm** cushioned for flexibility, insures quick action and long life; prevents rupture and shear. **2—Baffle plate action** positively controls diaphragm, causing more decisive opening and closing of valves and ports. **3—Syphon tube** opens valve faster, permitting a greater volume of air to pass with less pressure drop than conventional regulators. **4—Interchangeable parts**, easily removed without removing valve from airline.

Get **MORE** from air power—use Norgren Regulators. Write for catalog #400.

C. A. Norgren Co.,
22 Santa Fe Drive,
Denver 9, Colorado.

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TAKE A LOOK AT
YOUR MILLING JOBS
WITH THIS IN MIND...



Atlas
4 TOOL TEAM

Milling costs can be cut—despite higher labor rates. Use your *big machine* for *big work*. Install Atlas millers to *take over all small parts production*. You save set-up time, save power, save tremendously on equipment cost.

An Atlas performs all standard milling operations to close tolerances . . . at production tempo. Table is $4\frac{1}{2}$ " x 18"—travels 10" longitudinally, 6" vertically, $3\frac{1}{2}$ " cross-table. Spindle speeds from 62 to 2870 RPM provide correct range for all types of work and cutters. Back-geared power, complete V-belt drive, Timken bearings. Operates from $\frac{1}{4}$ HP motor. Three control mechanisms—manual, lever, Change-O-Matic available now for prompt delivery through Atlas distributors. Send for complete information.

ATLAS PRESS COMPANY
246 N. PITCHER STREET, KALAMAZOO 13, MICH.



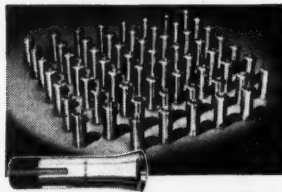


- SOUTH BEND LATHES IN THE TOOLROOM

WHERE PRECISION AND PERFORMANCE COUNT !

Nowhere in the plant are unfailing precision and dependable performance more important than in the toolroom. It is here—in the "tools that make the tools"—that the quality and cost of the product are largely pre-determined.

The ability of South Bend Lathes to perform a wide variety of precision operations makes them the most valuable and versatile tools in the toolroom. The ease and speed with which they can be changed from one set-up to another is a definite advantage and still another reason for their wide popularity. A complete line of attachments and accessories are available which will simplify your tooling still further. Write today for Catalog 100-D which illustrates in full color and completely describes the complete line of South Bend Engine Lathes, Toolroom Lathes, and Turret Lathes. Sent free, postpaid.



SOUTH BEND COLLETS

are available with capacities from 1/16-inch to 1-inch. Made in 1/64-inch steps. Write for Catalog 77 showing line of attachments.



SOUTH BEND LATHE WORKS

LATHE BUILDERS SINCE 1906

427 EAST MADISON STREET • SOUTH BEND 22, INDIANA

has
your shop got
the
**"TOOL ROOM
TROTS?"**

How much time is wasted "on the road" while punch press operators and set-up men go back and forth to the tool room to get punches and dies for a short run set-up?

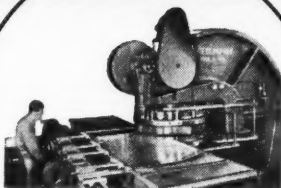
SEE A WIEDEMANN

With a Wiedemann Turret Punch Press, the operator remains at the machine . . . no need to make numerous time consuming "trips," since 11 to 32 punches and dies are carried in the turret . . . ready for instant piercing . . . always at the operator's fingertips. In addition, a Wiedemann saves you hours of layout time. On some machines, layout time is completely eliminated because of material handling gauge tables that position the material ready for piercing by obtaining the X and Y coordinate from blueprints or charts.

WIEDEMANN MACHINE COMPANY

1821 SEDGLEY AVENUE • PHILADELPHIA 32, PENNA.

Send today for the complete story of short run piercing economy . . . Bulletin 92 . . . and then if you'd like to see a Wiedemann in operation, we'll tell you the shop nearest you that does short run piercing with a Wiedemann.



This Type R-7 Turret Punch Press cut production time from over 12 hours to 73 minutes on short run jobs. Get the proof!

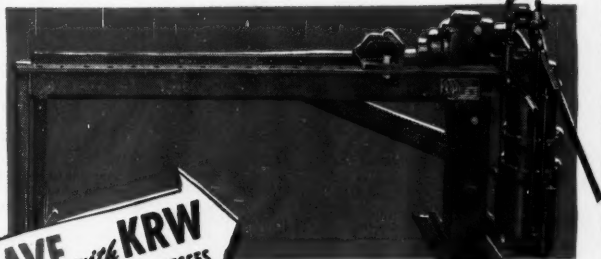
Save 3 ways with...

KRW ARBOR PRESSES

SAVE *with* KRW HAND-OPERATED PRESSES

1

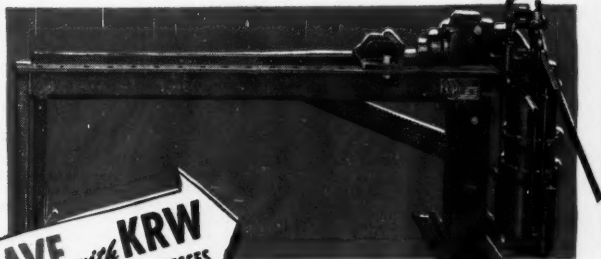
You name the job, and we'll name the KRW Press best fitted to do it better, faster, and at lower cost. Take KRW Hand-operated presses for example: they give more power with less effort...combining faster ram travel with a quick-acting finger controlled valve that makes the KRW Press outstanding in efficient hydraulic action. Twin pumps enable operator to vary ram speed. The special "Capstan" type handwheel brings the ram to the work fast as well as providing a "built-in" mechanical press for the lighter jobs. 30 days delivery guaranteed. Write for prices and catalog.



SAVE *with* KRW AIR-OIL OPERATED PRESSES

2

KRW Hydraulic Presses equipped with our "Speedi-Booster" operate on compressed air, providing tons of pressure at the ram by effortlessly raising or lowering the operating lever. In operation, compressed air enters an air cylinder, the piston of which drives the smaller hydraulic oil piston which, in turn, forces the oil under pressure to the large cylinder piston. Tonnage pressures are dependent upon initial air pressure and size of air and oil cylinders. 30 days delivery.

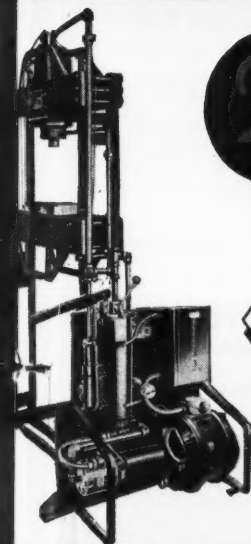


SAVE *with* KRW MOTOR DRIVEN PRESSES

3

Here is a self-contained power unit that drives KRW Hydraulic Presses. These units can be purchased separately to drive any existing KRW Press. The KRW Motor Driven Hydraulic Presses are low-cost, production units ideally suited for short runs or small work.

Presses are equipped with Seco Radial type pumps in capacities ranging from 3,000 to 10,000 PSL. Guaranteed by both the manufacturer and K. R. Wilson. Write for prices.



K. R. Wilson, 215 Main St., Buffalo 3, N. Y.

36

Please send me information regarding

KRW Hand-operated Presses ☐

KRW Air-oil Operated Presses ☐

KRW Motor Driven Presses ☐

Name

Address

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K. R. WILSON

215 MAIN ST., BUFFALO 3, N. Y.

**On the Job at
BEAVER TOOL and ENGINEERING CO.
The OLIVER ACE**

**TOOL & CUTTER
GRINDER**



"More accurate, faster and most economical machine in the plant," states Beaver Tool and Engineering Co.

Used for Grinding Carbide blades for cutters, the Ace has outperformed every other machine in the plant.

If you have a Cutter Grinding problem investigate the "Ace." It's tops in performance.

**IMPROVE YOUR TOOLROOM
IT'S THE BACKBONE
OF PRODUCTION**

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AUTOMATIC DRILL GRINDERS
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OWN THE MACHINE OF A THOUSAND USES



- VERSATILE • LOW IN PRICE
- EASILY SET UP • SMALL
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- A MONEY MAKER FOR YOU

The Welch Milling Machine HAS LARGE MACHINE ACCURACY AND FEATURES

There's a place in every shop, large or small, for one or more of these efficient, high speed machines.

The Welch Milling Machine is being used successfully in tool-making, shop production, experimental departments, laboratories, schools and home work shops. Built by master craftsmen to help other craftsmen master a large variety of jobs. Investigate this outstanding performer at once.

Specifications: Bench space required 18 inches x 24 inches. Spindle—1½ inches in diameter—8 pitch thread—15/16 inch hole through entire length; nose bored for No. 3 Morse taper. Spindle designed so that all 10 inch lathes, chucks, collets, face plates, etc., fit same. Arbor diameter 7/8 inch and 1 inch with No. 3 Morse Taper. Center of arbor to underside of arm—6 inches.

WRITE FOR COMPLETE DETAILS

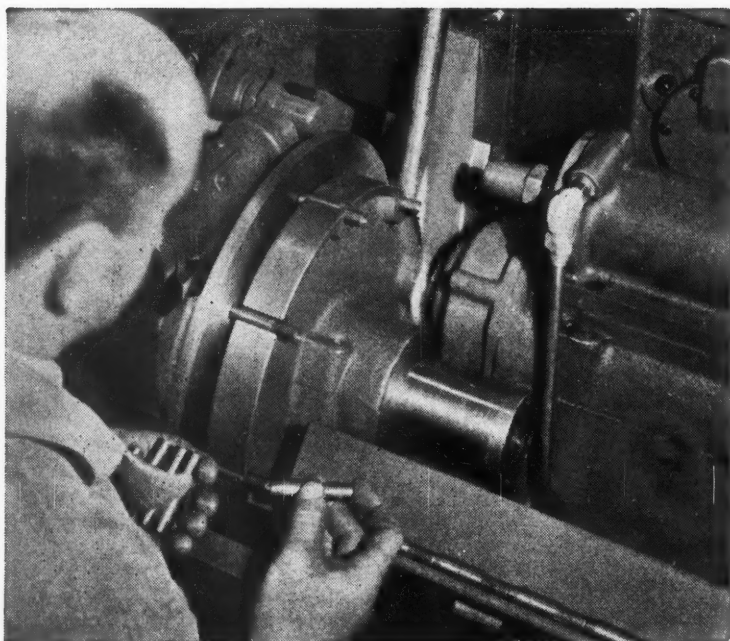
EASILY ADAPTED TO SPECIAL JOBS

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- SIDE MILLING
- PROFILING
- SQUARING SHAFTS
- TURNING

Welch

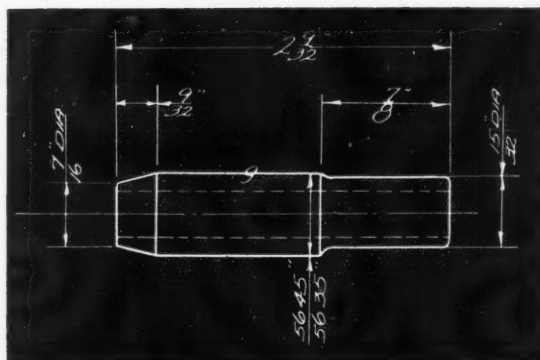
MACHINE TOOL CO.

411 East Third Street
MUNCIE, INDIANA



On this VALVE STEM GUIDE-JOB there is no necessity for using arbors. Special low angle centers enter the bore at each end, thus controlling concentricity of ground outside diameters with the bore. Production—700 per hour within .001" (.002" indicator).

This VALVE STEM GUIDE is but one of many jobs for which this versatile ARTER can be tooled.



ARTER GRINDING MACHINE CO.
WORCESTER, MASSACHUSETTS • U. S. A.

"Our HYDRATROL Lathe Does Better Work at Lower Cost!"



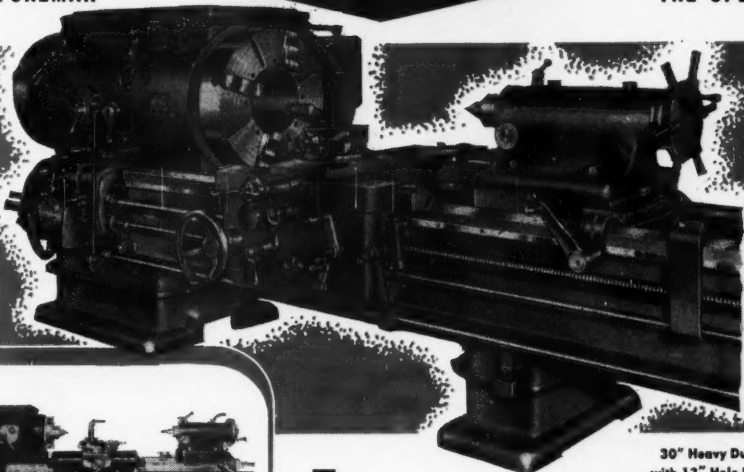
THE FOREMAN

Do it Better! on a HYDRATROL LATHE!

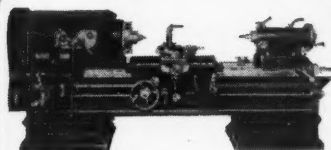
"Yes, and It's Easier to Run, and Increases Production!"



THE OPERATOR



30" Heavy Duty Lathe
with 13" Hole in Spindle



Standard Type, Heavy Duty HYDRATROL LATHES, 20" to 36"

The heavy 27" size, shown above, has all the ruggedness and power for the heaviest possible work. And its many refinements in design and construction result in an ease of operation comparable to small machines.

In hundreds of plants—under all sorts of conditions—LEHMANN HYDRATROL LATHES have invariably brought about faster production, better work, lower costs.

Look around your own shop—you may find a number of machining jobs which possibly could be done better on a Large Hollow Spindle Type of HYDRATROL LATHE. Send us prints of these unusual, difficult, or too-costly machining jobs, for a specific, time-and-money-saving recommendation.

FIVE SIZES 18" to 36"

Small	18" up to 7 1/8" Hole
Medium	24" up to 12 1/8" Hole
Large	27" up to 13 1/8" Hole
Large	30" up to 14 1/8" Hole
Large	36" up to 16 1/2" Hole

Lehmann MACHINE COMPANY

CHOUTEAU AT GRAND . . . ST. LOUIS 3, MISSOURI

Brightboy

REG. U. S. PAT. OFF.

***BRIDGES THE GAP BETWEEN
GRIND AND BUFF**



In a single operation, Brightboy burrs, finishes and polishes. Thus these in-between production steps are "bridged" — saving time and eliminating operations.

Brightboy's rubber binder cleans and polishes simultaneously with the burring and finishing operation of the abrasive.

Ask your dealer for catalog, prices and applications-data; a Brightboy service man for production-procedure recommendations.

**BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
Newark 7, N. J.**

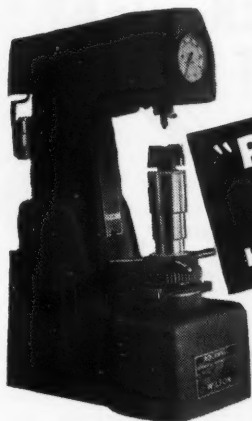
**This original Brightboy slogan introduced a new type of metal-finishing. Brightboy has since become a "buy word" for leading American industries.*

THREE TEXTURES

**Brightboy Standard
Brightboy Fine-Text
Brightboy Tuff-Text**



*the Soft Rubber Binder
CUSHIONS the Abrasive*



"ROCKWELL"
Superficial
HARDNESS TESTER

**...FOR GENERAL,
AS WELL AS
SPECIAL HARDNESS TESTING**

With the "ROCKWELL" Superficial Tester, indentations are .005" or less in depth. Readings are as dependably accurate as on the regular "ROCKWELL" Tester, where the surface is smooth. Thus it can be used where extremely shallow tests are required. And where material is sufficiently homogeneous in depth of hardness, a test on the "Superficial" is equivalent to one on the regular "ROCKWELL." This wider range of use accounts for the trend toward the "ROCKWELL" Superficial Hardness Tester.

WILSON MECHANICAL INSTRUMENT CO., INC.

AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.

230-G PARK AVENUE, NEW YORK 17, N. Y.

ACCO



**TOOL-MAKERS — MACHINISTS
MANUFACTURERS**

**YOU ARE 3 STEPS NEARER
YOUR FINISHED PRODUCT**

WITH

MARSHALL VELVET FINISH



PRECISION GROUND FLAT STOCK

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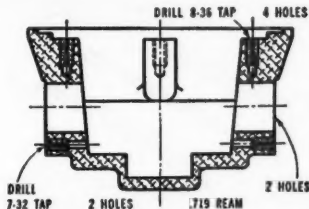
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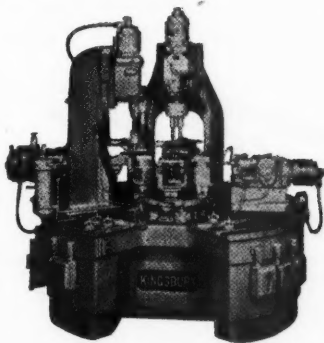
Problem

Drill, tap and ream this die cast motor end bell. Accurate location is important.



Method

SPECIAL ROTATING FIXTURES make possible operations on both sides of the piece. In a single chucking, operations are performed progressively on one side at the three working stations, then the operator rotates the fixture 180° and the opposite holes are machined.

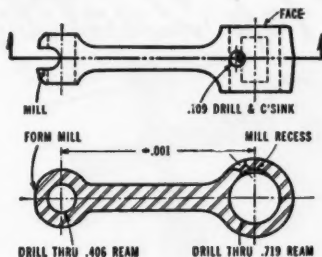


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220 PIECES PER HOUR GROSS and substantial savings costs. If your high production work requires multiple drilling up to an inch or so in diameter, let us propose a machine that will be completely designed and tooled ready to do your job. Send us a print and outline the operations and hourly production desired.

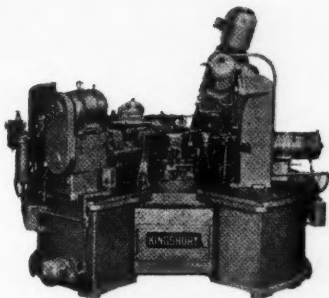
Problem

Machine this forged steel connecting rod as shown.



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Results

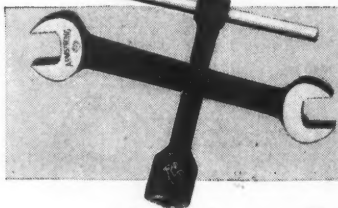
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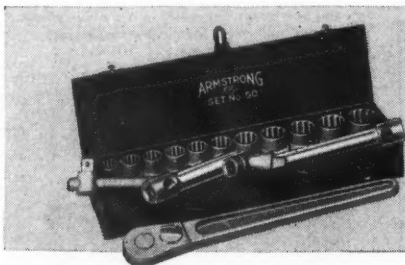
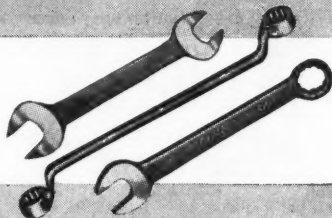
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MODERN Machine Shop

FEBRUARY, 1947

VOL. 19, No. 9

CINCINNATI, OHIO

This Month

In this month's feature article, which starts on page 124, G. E. Shubrooks, Chief Chemist and Metallurgist at the Hamilton Watch Company, tells how the Tukon tester is used with the Knoop indenter to test the hardness of small tools and other extremely small objects. The Tukon tester will find a place in many laboratories and tool inspection rooms, consequently the information in Mr. Shubrooks' article is as timely as it is interesting.

In the second article of his series on "Incentives for Supervisors and Executives," Albert Ramond, President of Albert Ramond and Associates, discusses the measurement of performance, standards of comparison and factors to be considered in the incentive formula. Incentives comprise an important factor in modern plant management; the proper application of incentives to peacetime production would have eliminated most of the wage and hour and portal-to-portal pay controversies that are slowing down production and increasing prices today. The material presented in Mr. Ramond's articles is the result of many years of experience in this work. Page 138.

Our English correspondent, Mr. E. R. Yarham, has "boiled down" the experience of a number of prominent British manufacturers to obtain the data for his article "Machining Wrought Aluminum Alloys," which will be found on page 164. The executives of any plant that does any amount of machining of aluminum alloys will find the material in this article both interesting and practical.

The old question as to how many teeth a carbide cutter should have to produce the best results is discussed again by Carl LeMay, Test Engineer of the Carboloy Company, Inc., on page 204. By following the formula outlined in the article, any tool engineer should be able to settle this question once and for all.

The feature articles are followed by the usual departments containing short but highly useful discussions of tools and equipment.

Microhardness Testing of Small Tools

In this article the author discusses the advantages of the microhardness test for determining the quality of small tools. The data were contributed by the Research Division, Hamilton Watch Company.

By G. E. SHUBROOKS

Chief Chemist and Metallurgist,
Hamilton Watch Company, Lancaster, Pennsylvania

ALTHOUGH several well-known types of testing instruments are now available for determining the hardness of metals, until recent years consistent accuracy in the testing of small tools has been a practical impossibility. However, due to the development of the Tukon hardness tester,

with which the Knoop indenter is utilized, accurate tests for hardness on extremely small tools can now be obtained in a way that is both satisfactory and practical.

Using the Tukon tester, routine tests on small tools and small parts have been conducted in the research laboratories at the Hamilton Watch Company, Lancaster, Pennsylvania, for some time past, the information gained as a result of these tests being applied to aid in increasing the life of the tools. In this article the author has placed special emphasis upon the application of the Tukon tester for testing very small tools and upon very small areas, although he appreciates the fact that not every shop uses the small tools discussed here. However, the same tests would be equally effective when applied to larger tools.

Hamilton's experience with the Tukon tester dates back to February of 1942, and the original work conducted by Morrison and Gill¹ in connection with hardness testing at that time is

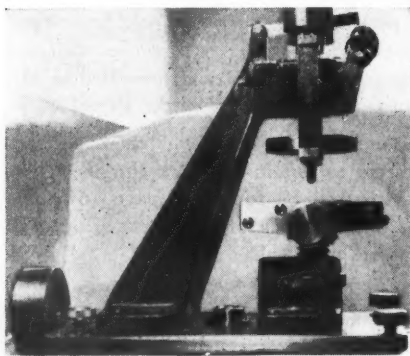


Fig. 1—One of the original microhardness test instruments upon which tests were conducted by J. G. Morrison at the Landis Machine Company, Waynesboro, Pennsylvania.

held in high esteem. Among the other very interesting data developed on the nitriding of hardened high speed steels, Morrison and Gill show the microhardness numbers of samples of hardened high speed steel which were nitrided at various temperatures.

The microhardness was obtained by using various loads ranging from 100 grams to 2000 grams. The tests were conducted by means of an instrument which had been made to the design suggested by the late Frederick Knoop, who personally had lapped the diamond indenter to the fine degree of accuracy required.

The Wilson Mechanical Instrument Company, Incorporated, has been successful in developing a technique for producing satisfactory Knoop indenters on a commercial basis and, in addition, has developed the commercial Tukon tester. The instrument now in use at Hamilton Watch, shown in Fig. 2, was one of the first models in use and has been rebuilt to include an electrical device for reducing the impact between the specimen and the indenter.

With the combination of Knoop indenter and Tukon tester, microhardness readings are made and recorded as Knoop numbers, which may then be converted to Rockwell hardness numbers. Shallow hardness indentations are produced with the Knoop indenter, which was first described by Knoop, Peters and Emerson². The indenter is a pyramidal diamond with the angles cut as indicated in Fig. 3.

The indentation is applied to polished steel surfaces with working loads of 25 to 3600 grams, depending upon the relative hardness and thickness of the material being tested. By means of a suitable electrical control the load is automatically applied for 20 seconds, which is the minimum time required for consistent results. The elongated diamond shape of the indentation, as shown in Fig. 4, permits ex-

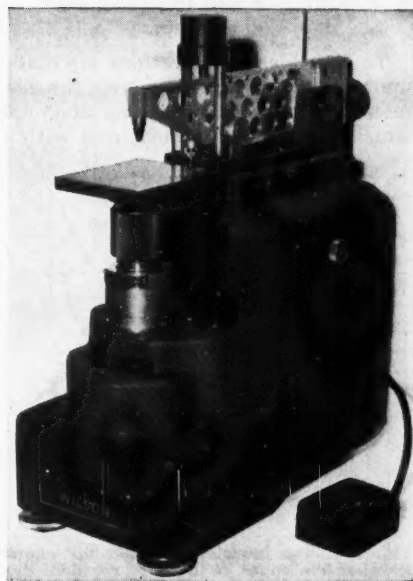


Fig. 2—Tukon Tester, showing the Knoop indenter attached to the perforated beam. Also shown is the platform on which the specimens are placed.

treme measurement sensitivity. The long diagonal measures approximately seven times the width and thirty times the depth of the indentation.

Specimen Preparation

Specimens which are to be hardness tested are usually mounted in melamine plastic material and polished successively with fine emery paper and fine abrasive laps. The surface of the specimen must be perfectly flat and free from deep scratches. The care required in the preparation of the specimen is perhaps the only disadvantage in the use of the Tukon tester for routine purposes. However, after the necessary skill has been acquired in the preparation of the specimens, it has been found practicable to use this test in a routine manner.

Testing of Small Precision Tools and Parts

The hardness indentations are made upon the polished surface with the diamond indenter, and the long diagonal which is produced is measured with a

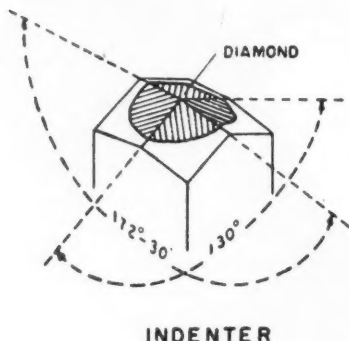


Fig. 3—Knoop Indenter, showing the angles between the edges of the flat pyramidal diamond point.

filar micrometer microscope. The Knoop hardness number may then be determined by converting the micrometer reading to millimeters and referring to a table which is supplied by the Wilson Mechanical Instrument Company. This table is computed for theoretically perfect indenters and when maximum accuracy is desired the following equation is used for calculating the Knoop number:

$$I = \frac{W}{A} = \frac{WF}{L^2 K^2 C}$$

where

I = Knoop hardness number

W = Load applied to indenter (in kilograms)

A = Projected area of indentation (in square mm)

F = Correction factor supplied by National Bureau of Standards for each Knoop indenter

L = Length of indentation (in micrometer units)

K = Calibration factor for converting micrometer units to millimeters

C = 0.07028, a constant for converting indentation length in millimeters to projected area.

If we let Q replace F/K^2C , (a calibration constant which can be calculated for every indenter and optical system), the equation may be simplified as follows:

$$I = \frac{W}{L^2} \cdot \frac{F}{K^2 C} = \frac{QW}{L^2}$$

Taking the logarithm, the equation becomes

$$\log I = Q \log W - 2 \log L$$

which is a family of straight lines when plotted on logarithmic graph paper. It is possible to plot the graph on a scale sufficiently large to prevent introducing errors greater than the probable error in measuring the indentation.

Figure 5 shows a typical graph plotted for loads of 0.5 and 1.0 kilogram. For loads other than these, the 1.0 kilogram line is used and the Knoop number obtained is multiplied by the actual load to get the true Knoop number. The advantages of such a graph are threefold: first, it is possible to de-

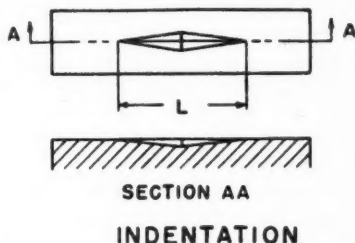


Fig. 4—Diagram of Knoop indentation. Ratio of length to width is 7:1. Ratio of length to depth is 30:1.

termine rapidly the value of the Knoop number; second, the Knoop number obtained is of maximum accuracy; third, the micrometer reading is used

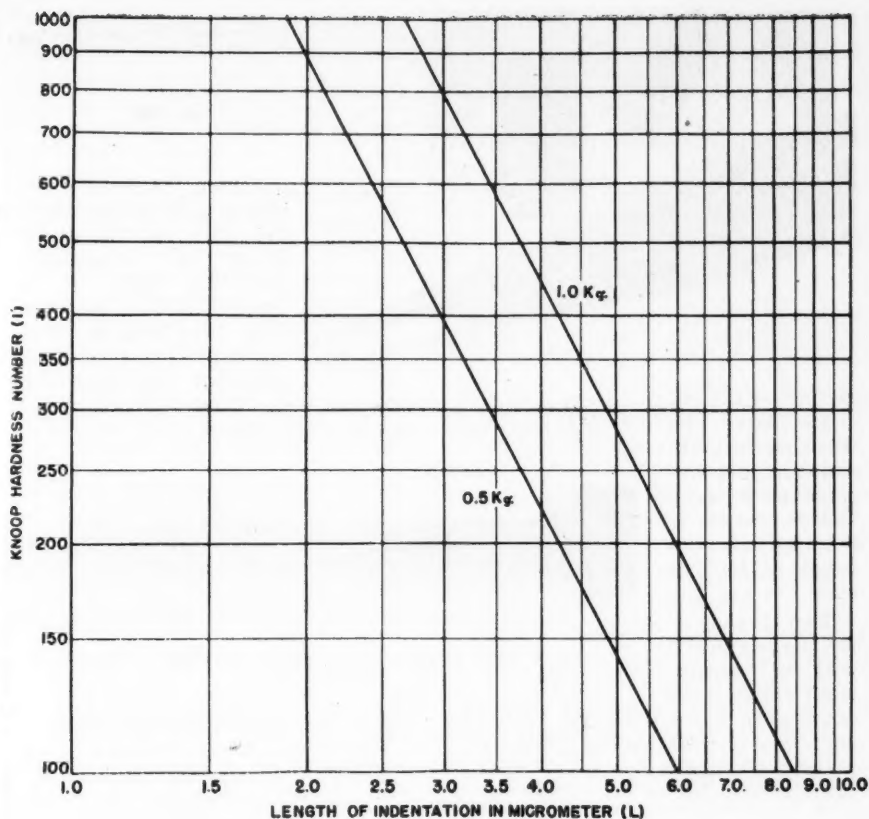


Fig. 5—Graph for converting length of indentation to Knoop hardness numbers

directly without conversion to millimeters.

In connection with routine examination of small tools, such as threading dies, drills and taps, it is often necessary for the metallurgist to make a study of the microstructure of the hardened tool and conduct a hardness test in order to determine the condition and take steps to ensure maximum quality. It is possible to "kill two birds with one stone" because the sample is prepared for microscopic examination by mounting in plastic, polishing and etching, and then examin-

ing for structure. The Tukon test can then be performed without additional preparation.

An example of this procedure is the threading die used for making small watch screws (0.055 inch-diameter thread; 100 threads per inch). This die is shown in Fig. 6 at a magnification of 2X.

In certain machineability experiments it was necessary to determine the microstructure and hardness of this threading die, and particularly the hardness of the cutting tips of the threads. The machining tests were

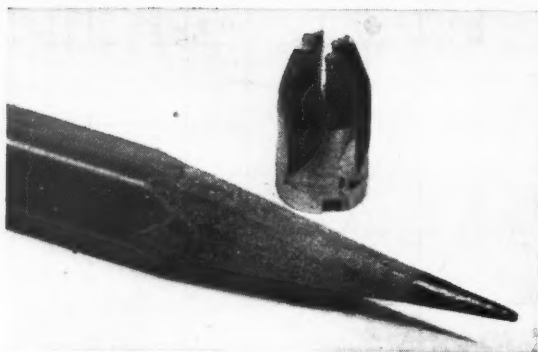


Fig. 6—Small threading die used in making watch screws (X2).

completed, the die was cross-sectioned, nickel plated, mounted in plastic, polished, etched, examined, photomicrographed, and Tukon tested. A photomicrograph at 150X is shown in Fig. 7.

Two threads of the die are shown with two indentations which were made with a 0.3 kilogram load. The white layer on the thread is the nickel plating which was applied in order to prevent rounding of the sample during

that rounding in the polishing process causes slight errors in the results ob-

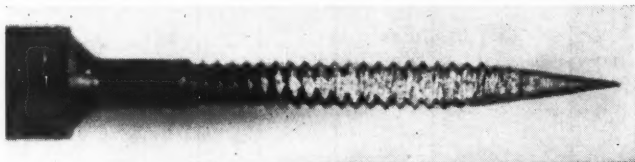


Fig. 8—Small balance tap used in the production of balance wheels (X20).

tained in the microhardness test.

This same type of test is also successfully made on small balance taps such as that shown in Fig. 8. This photograph (at 20X) shows a tap, 0.0132 inch diameter, 260 threads per inch.

In Figure 9 it can be seen that the Knoop indentations are in close proximity to the teeth of the tap. This photomicrograph, at 250X, shows two threads of the tap and the

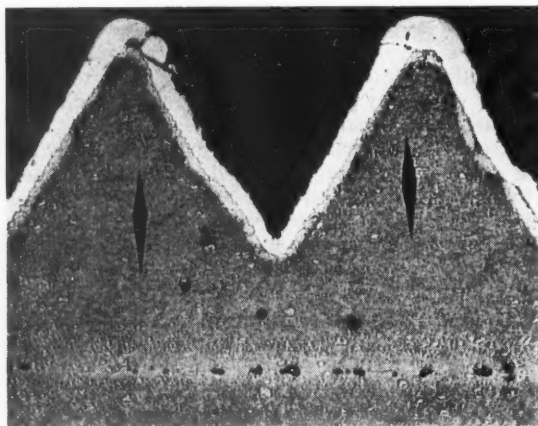
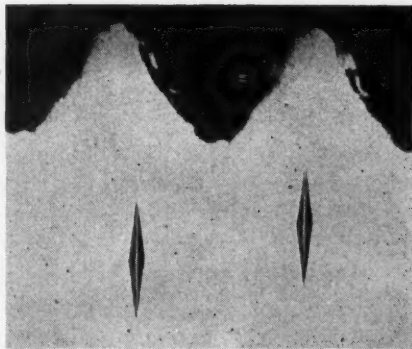


Fig. 7—Knoop indentations on cross-sectioned threads of die shown in Fig. 6 (X150). Load, 0.3 kilogram. The white layer is nickel plate.

Fig. 9—Knoop indentations close to the cross-sectioned threads of the tap shown in Fig. 8 (X250).



indentations, which were made with a 0.2 kilogram load. Standard Rockwell or Rockwell Superficial tests can be performed on the shank of this balance tap, but because of the extreme accuracy required it is necessary to know the hardness of the tool at the working edges. The tap was prepared in a manner very similar to that described previously for the preparation of the cross-section of the threading die.

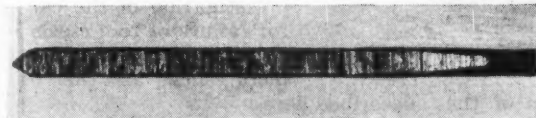


Fig. 10—Small flat drill used to drill holes in plates (X22).

Large drills and small drills are used in the watch industry, many of them being as small as that shown in Fig. 10. Some of the drills are even smaller. This figure shows a photograph of a flat drill 0.0068 inches in diameter at a magnification of 22X.

In order to learn the hardness of the working portion of a drill of this size it was necessary to again suitably prepare the specimen for hardness testing and in Fig. 11 is shown, at 250X, a microhardness indentation on the longitudinal section of the tip of the drill. A 0.3 kilogram load was used and when the resultant value was con-

verted to Rockwell C scale the hardness was found to be 65.

It should be noted that the lack of symmetry on the pointed end of the drill is due to the fact that this longitudinal section is not exactly parallel to the original flats which are ground on the drill.

Circular tooth cutters are employed for producing the tooth forms on pinions which are used in watches and small instruments. Figure 12 shows a photograph, at 5X, of a train-tooth cutter whose actual overall diameter is 0.530 inches. Here again it is de-

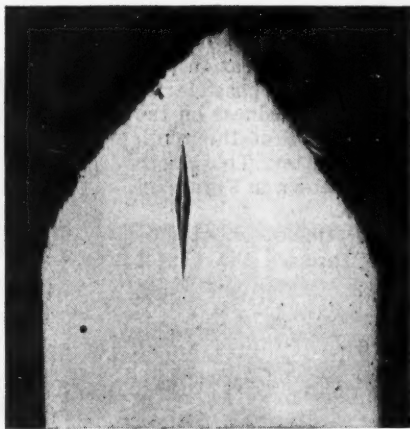


Fig. 11—Knoop indentations on a longitudinal section at the tip of the 0.0068-inch drill shown in Fig. 10 (X250).

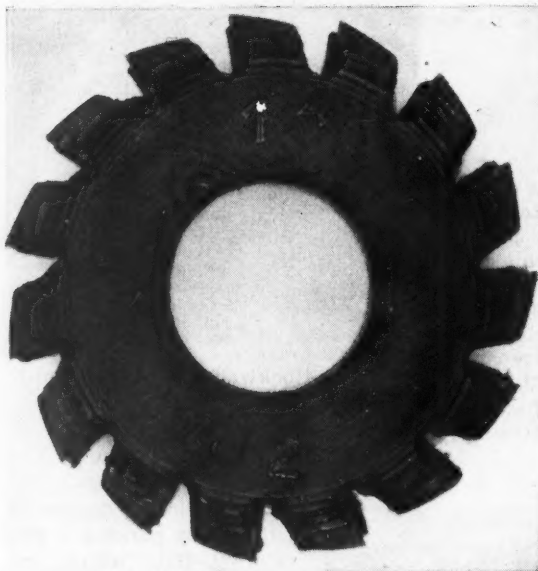


Fig. 12—Small train tooth cutter used in making pinions (X5).

line, on the short diagonal of the diamond-shaped indentation, is 0.0075 inch. The test was made with a 0.5 kilogram load. The hardness was converted to Rockwell C66.

Testing of Tool Steel

The checking of the hardness of specific areas during the examination of tool steels is also possible with the Tukon tester. The investigation of the cause for failure of tool steels is aided by microhardness tests such as the one

described here.

It was found that a particular brand of tool steel failed in heat treating and was subsequently rejected because of the carbide stringers which were disclosed upon microexamination, Fig. 15, at a magnification of 250X, shows the unetched specimen of the tool steel with the carbide stringers plainly visible. The microhardness indentation

described here.

It was found that a particular brand of tool steel failed in heat treating and was subsequently rejected because of the carbide stringers which were disclosed upon microexamination, Fig. 15, at a magnification of 250X, shows the unetched specimen of the tool steel with the carbide stringers plainly visible. The microhardness indentation

The thickness of the tooth through the center

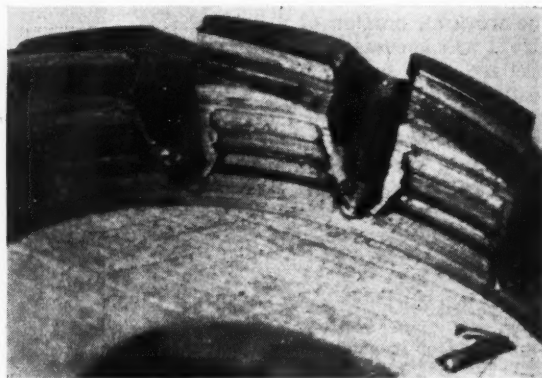


Fig. 13 — Portion of the train tooth cutter shown in Fig. 12 (X10).

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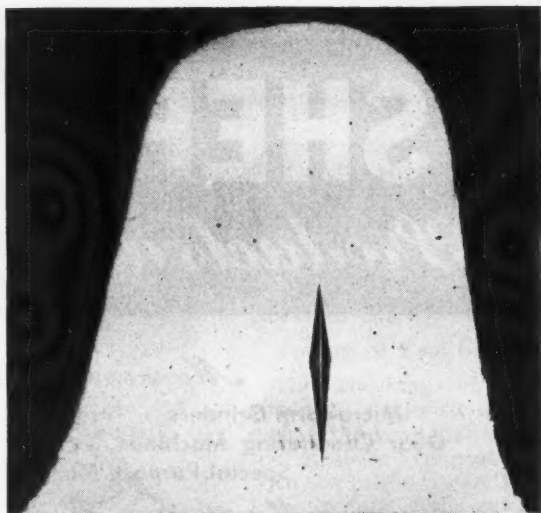
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Fig. 14—Photomicrograph of an indentation on the tooth face of a train tooth cutter (X250). Through the center line of the indentation this tooth face measures 0.0075 inch.

partially covers one stringer in the center of the photomicrograph. The width of the carbide stringer at this point was 0.001 inch. The indentation was made with a 0.5 kilogram load and the hardness of the carbide area, when converted to Rockwell, was C73.

In a similar manner to that described above for checking tool steel it is possible to make very accurate tests on small areas of watch parts. In Fig. 16, at 8.5X, is shown a typical watch regulator with an overall length of 0.330 inch. The length of the index end of the regulator is 0.146 inch.

In connection with difficulty which was encountered in the heat treating of these regulators it was necessary to check the hardness on the index end. The part was subjected to microexam-



ination, and other methods of hardness test were applied. No variation in the hardness of the index could be discovered and no carburization was revealed.

However, upon placing a Knoop indentation 0.002 inch from the edge of the index and in a manner so that the indentation ran longitudinal with the longitudinal section of the index, a definite increase of hardness was found near the edge of the part. The hardness in the center portion was Rockwell C43 and the hardness close to the edge was very much higher. This condition clearly indicated a slightly carburized edge even though the steel was of such a type that the carburization did not show in the routine microexamination. The tests were made with a 0.3 kilogram load. Fig. 17, at 250X, shows the indentation.

In the routine of inspection, hard-

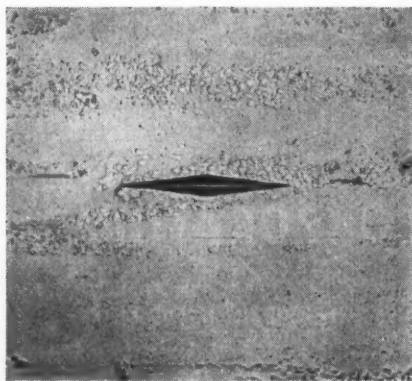



Fig. 15—Knoop indentation on a carbide-rich area in a sample of tool steel, unetched. Load, 0.5 kilograms. (X250).



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Fig. 16—Watch regulator with index end 0.146 inch long (X8.5).

ness tests are performed upon many of the small pinions, gear wheels and arbors, which are manufactured for use in watches and instruments.

It is possible to hardness test minute areas on pallet arbor pivots which have a diameter of 0.0049 inch. It is also possible to conduct tests on gear teeth with a width as small as 0.0035 inch. In fact, it has even been both possible and necessary to produce indentations upon the surface of sap-

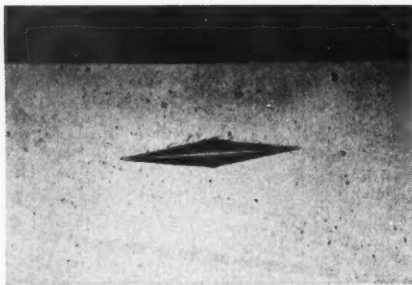


Fig. 17—Indentation on the longitudinal section of the regulator index, 0.002 inch from the edge of the piece (X250).

phire jewels with a 0.3 kilogram load, as shown in Fig. 18 at 800X.

Winchell, in his article on the "Use of the Tukon Tester as a Mineralogical Tool" describes Knoop hardness as a function of orientation in certain minerals. He gives many references to the hardness properties of synthetic sapphire, or corundum, which is used for jewel bearing manufacture.

The Tukon tester has been found of value in other companies for both research and production testing and other papers have covered some of these additional uses of the instrument*.

Because many tool manufacturing companies use the Rockwell scales for



Fig. 18—Knoop indentation on the surface of a synthetic sapphire jewel. (Corundum) Load, 0.3 kilograms. (X800).

identifying hardness, it is essential to be able to correlate Rockwell numbers with Knoop numbers. Fig. 19, therefore, shows a conversion graph plotted from data carefully accumulated by making numerous Tukon tests with a 0.3 kilogram load on standard Rockwell test blocks. The correlation of Rockwell and Knoop numbers is fairly accurate. The 0.3 kilogram load was employed because it is the one most frequently used in the laboratory. The

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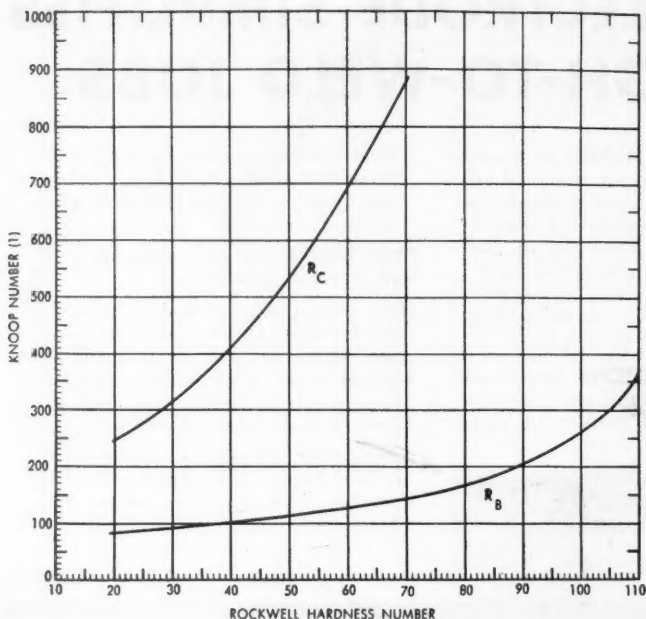


Fig. 19 — Chart for converting Knoop numbers to the Rockwell B and C numbers. Load, 0.3 kilograms.

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Acknowledgment

Appreciation is expressed to the Hamilton Watch Company for its support of this work and for the use of the Tukon tester. Credit is also due to Mr. Howard Swarr, Supervisor of Metallurgical Research, Mr. H. M. Cobb, Jr., Senior Metallurgist, and Mr. William Thumma for their cooperation in connection with the preparation of the manuscript. Much of the material and the specimens for the tests which are mentioned in this article have been prepared by these men. We are also grateful to Mr. M. N. Rivenburg of the company's Advertising Department for his editorial assistance in the preparation of the manuscript.

chart will give approximate correlation values for loads other than the 0.3 kilograms but with increasing deviation at lower loads.

The instrument described is adaptable for the testing of many types and kinds of materials, both metallic and non-metallic. Its range actually extends from hard materials, such as sapphire, to the softest metals and minerals. In addition to this range of application, it is worth repeating that with the Tukon tester minute areas can be tested and accurate results can be obtained on exceptionally thin parts or tools. Even the hardness of thin electrolytically-deposited coatings can be successfully tested.

Small tool users could uncover much information if they would investigate the possibilities of performing tests such as those described. It is believed that commercial laboratories would conduct tests for shops which are not in position to do their own testing.

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Turning S.A.E. 4145 Annealed, 315 S.F.P.M.



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Spindle Speed: 280 R.P.M.

Depth of Cut: $\frac{3}{4}$ "

Cutting Speed: 315 S.F.P.M.

Feed: .017"

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Cutting Lubricant: 1 part Sunoco to 20 parts water

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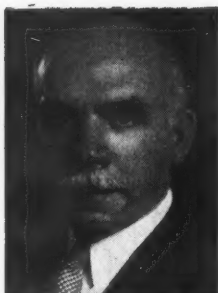
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ALBERT RAMOND

Incentives for Supervisors and Executives, II

Measurement of Performance — Standards of Comparison — Factors to be Considered in the Incentive Formula

By ALBERT RAMOND, President

Albert Ramond and Associates

HAVING reviewed the broad, guiding principles which should form the basic philosophy and foundation of any incentive program for supervisors and operating executives, let us now try to carry those general thoughts into a more specific study of means to develop, apply and administer such plans.

The duties of supervisors, such as foremen, are essentially to do whatever they can in their own departments to meet production requirements at the lowest possible costs while maintaining the desired quality of the product. This objective must be associated with good personnel, labor and public relations, good working and safety conditions, and proper maintenance of plant and equipment. All supervisors are expected to cooperate with all other members of the organi-

zation, and to respect and support the company policies.

The duties of operating executives are similar, on a broader basis, and with proper emphasis on some. This means that the general factors to be considered in any supervision incentive program should be:

1. Production
2. Costs
3. Quality
4. Maintenance of plant and equipment
5. Working conditions, Health and Accidents
6. Industrial relations
7. Cooperation

These factors and their influence on the supervisor's functions should be expressed and weighted in the final formula so that it will truly be representative of performance value.

Measurement of Performance

To provide for measurement there must be developed a standard of com-

The concluding article of this series will be published in the March issue of this magazine.

parison which will, in turn, indicate whether the performance is better than, or equal to or below a reasonable expectation. This standard must be fair and should not be influenced by past performance or accomplishments, because the past may have been good, bad or indifferent.

If past experience is taken as standard, those who have done a good job are placed at a disadvantage and have difficulty, despite great efforts, in exceeding their past accomplishments. Those whose performance was poor or only fair, on the contrary, are readily able to improve it, even though they are still a long way from the ultimate possibilities. The standard, therefore, should be established through careful studies of the possibilities, irrespective of past performance, and some supervisors' or executives' accomplishments may well be found to be already better than what a fair standard might call for.

The practical way to accomplish this is to study and analyze each one of the factors entering into supervisory or executive functions and determine in each case what constitutes a fair and reasonable expectation. In some cases this can be done quite accurately through well known and accepted means, such as time study for determination of labor productivity, and engineering studies for the determination of equipment productivity. For the factors where such precision is not readily obtainable, the standards set should be the result of the considered judgment of those who know the most about the particular factor under consideration.

In no case should a standard be picked out of the air because it is what some one else has already done once, or because of what somebody else is presently doing, or because it is an improvement over the past, and therefore, a sure insurance that incentive will be paid only when there are im-

provements. Records of past accomplishments or knowledge of what somebody else is doing can and should have informative value, but all data should be analyzed by competent people and the proper corrections and adjustments made so that the standard is truly fair and applicable in each particular condition.

Factors to be Considered

In general, it is better to consider only the more important of the factors over which there is unquestionable control, rather than to include all minor responsibilities and results over which there is only a small or questionable degree of influence. It may be, for instance, that production volume is regulated by a process, the control of which is altogether removed from the supervisor. If this is the case, "production" will not be a factor. The same may be true of "quality." In some cases maintenance of plant and equipment (including cleanliness) may be relatively negligible.

Partial Responsibilities

When the consideration is important but the responsibility is divided, an allocation of partial responsibilities should be made if possible. If such allocation is not possible, then the factor should be considered at a fraction of its full value, equal to the estimated degree of responsibility. For instance, if quality; i.e. defective work, rejects and re-operations, is controlled by several conditions including some over which the supervisor has no control, the causes for rejects and re-operations should be analyzed, classified, and allocated accordingly. If this is too involved, or impossible, then it may be estimated or found, from the record, that an average of perhaps 50 per cent of the total comes under that supervisor's control, in which case the qual-

ity factor would be taken at 50 per cent of its full value.

An effort should be made to keep this fractional practice down to a minimum and limited to perhaps three steps; three-fourths value, or one-half value, or one-fourth value, rather than to attempt to determine a more precise co-efficient for something which is bound to be approximate. For example, if the estimated responsibility seems to be only 5 per cent of the total, it might just as well be forgotten altogether. If, on the other hand, the estimated responsibility reaches 90 or 95 per cent of the excess cost or lost time, it would be best to take 100 per cent.

Standards of Comparison

The next step is to determine what constitutes a proper and reasonable norm or standard of comparison for each factor. This may demand division into subfactors when the more inclusive factors of production, or cost, or quality are dependent upon such subfactors, or when the subfactors correspond to more readily-available records.

With production, for example, the important thing may be equipment utilization, or labor productivity, or turnover and training of new employees, or even quality control. A foreman who secures maximum equipment utilization, high labor productivity, trains beginners rapidly and keeps a steady labor force in doing about all that can be asked of him to facilitate production; thus the subfactors, rather than production volume as such, should be considered.

"Cost" will be affected by the productive utilization of men, equipment, materials, supplies, power, heat, by maintenance and repairs, by poor work, by accidents. Each subfactor will have to be analyzed and "standardized" if it is a relatively important element of cost.

Foremen now have little or no control over wage rates, but they might have considerable influence over worker's incentive or bonus wages—which are an important factor in production and industrial relations. If the workers' incentive or bonus wages are predicated on productivity, this subfactor of productivity, because of its influence on production, costs and wages, is an important consideration in the supervisor's incentive formula.

Quality will include rejects and reoperations, the cost of which is generally measurable, and also perhaps a more general and more indefinite appreciation of general quality values when the product is such that, while good enough to pass inspection, it is desired that it be better than the passing point.

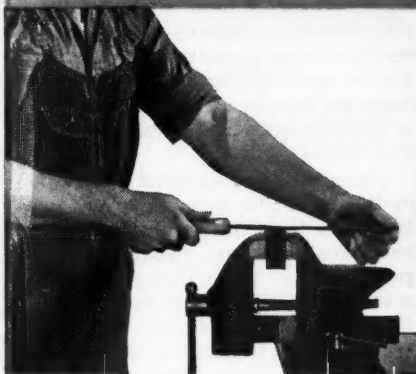
Productivity and Cost

For a measure of labor productivity there is available the well-known procedure of time study and operation analysis which, if properly carried out, will provide a dependable measure of labor performance. When the labor productivity standards are expressed in terms of standard man-minutes or man-hours, the relationship of the total standard credits in man-minutes or man-hours to that of elapsed time gives the percentage of productivity or index of labor efficiency.

For instance, if the standard time equivalent to all the departmental production is 12,000 standard man-hours and the actual elapsed and paid time is 10,000, then the productivity index is 120 per cent or 20 per cent above standard. If the production was equivalent to 9000 standard man-hours for the same 10,000 actual man-hours, the productivity index would be 90 per cent or 10 per cent below standard.

When this index is less than standard, the result is an excess cost which becomes greater as actual results drop farther below standard. This excess

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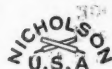
WRONG

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(Parentheses indicate pages of FILE PHILOSOPHY containing correct answers)

1. What things is the mechanic in the "Wrong" picture doing incorrectly? (p. 30)
2. What three important things must filer do right to do a good job? (p. 28)

3. In what three elemental ways can file be put to work manually? (pp. 28-29)
4. What is proper height for work in vise for (a) general filing; (b) heavy filing; (c) delicate filing? (p. 29)
5. What accessories should be used for holding soft metals in vise for filing? (p. 29)
6. What is best way of holding file for ordinary filing? (p. 29)
7. What is proper way of "carrying" file across work? (pp. 29-30)
8. What is drawfiling and how should file be held and "carried"? (pp. 30-31)
9. How should file be held against work in lathe filing? (p. 31)
10. What special file is made for lathe filing and what are its features? (p. 31)



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cost can be calculated on an actual precise basis or on an average basis. With the first method, every shortage is priced at the worker's actual rate. That is; if a worker produces only 7 standard hours in an 8-hour day, the result is an excess cost of one hour at his actual hourly rate. When a group or a department as a whole is taken as an average, then all the shortages, whether due to production below standard or paid delays or anything else, are priced at the weighted average hourly rate for the group or department. This is quite practical and sufficient where the various labor rates do not present great differentials.

The labor productivity measure should, of course, include all labor, whether direct or indirect. Even on indirect operations such as trucking, inspection, cranes, repairs, and so on, coverage by direct standards is frequently possible and preferable to "ratios" predicated upon an average relationship between production and indirect work. If direct standards demand too-involved studies or administration, then one may have to fall back on some form of relationship with whatever influences the legitimate, or standard, amount of necessary indirect work. That relationship should be predicated upon the most influential factor or factors, which may be production, the number of different operations, the number of orders, the number of changes, and so on.

There exists a close relationship, but not necessarily a constant one, between labor productivity and labor costs. Generally speaking, costs are lower when productivity is high. This is always true when straight day work wages are paid. It may not be true when piece work or some other form of incentive pay is provided.

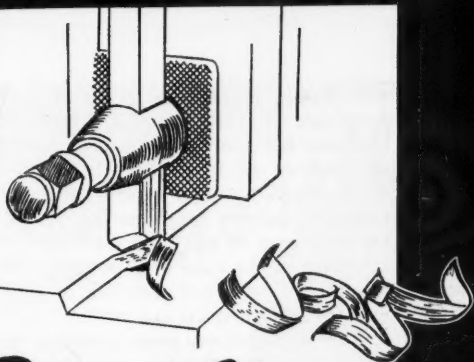
For instance, a piece worker producing at a 150 per cent index of productivity for 6 hours and waiting for

work for 2 hours will be paid the equivalent of 150 per cent of 6 hours, or 9 hours for his work plus 2 hours delay, or a total of 11 hours. If he had done the same amount of work in 8 hours without any waiting, he would have received only 9 hours pay instead of 11 and the labor cost per piece would have been proportionately lower. However, unless such conditions prevail to a considerable extent, or unless the wage incentive plan for workers is very poorly administered, the average degree of labor productivity is closely indicative of labor cost, and vice versa.

When labor productivity is a factor in the incentive formula, care should be taken that its weight is not such as to foster undue pressure for high productivity. Even though few foremen might be so tempted and even though labor is now quite able to protect itself on that score, the fact that supervisors' direct influence on labor productivity has been materially reduced has brought a change in the old concept that the foreman's job was primarily to secure the highest possible labor productivity.

Management is expected to maintain the best operating conditions at all times so that the standard norm can be reached with reasonable labor effort. A higher level of productivity; that is, above this standard norm, should be primarily the result of extra labor application and effort such as may be voluntarily supplied because of special incentives or rewards.

All this explains why the factor of cost; i.e., actual cost related to standard cost, rather than of productivity, may be used more satisfactorily under present conditions. As long as productivity is below standard, cost is just as effective a factor, but the cost influence decreases as productivity exceeds standard. Except on straight day work when productivity above standard is hardly expected, minimum



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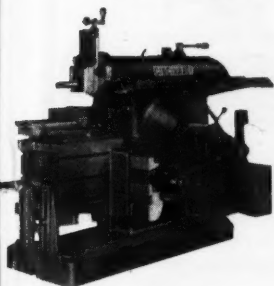
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labor cost may be reached just as soon as productivity reaches standard. In practice there is always some excess cost at the standard level of productivity and this excess decreases as productivity increases, but the rate of decrease in cost is much less than the rate of increase in productivity.

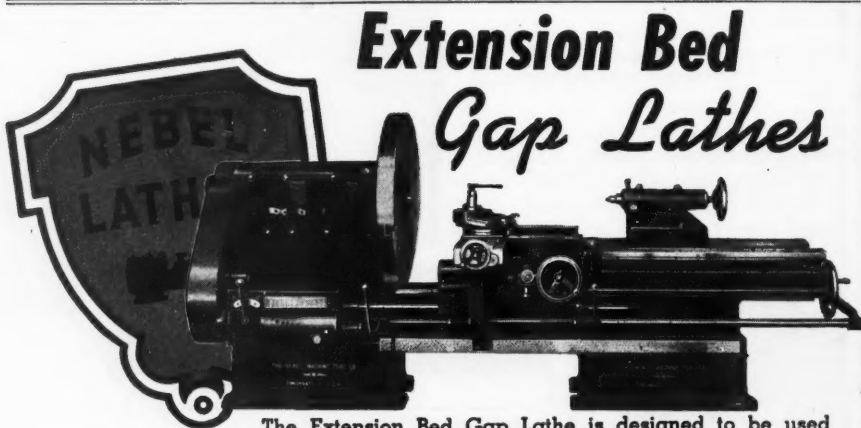
Whether a labor productivity or a labor cost index is used in the incentive formula, the importance of this factor demands that it should be determined as accurately as possible.

Equipment

The factor of equipment utilization may be very important in some cases and negligible in some others. If equipment values are small it might be just as well to forget it. If, on the other hand, the equipment represents a very large investment, or carries a high depreciation rate, or is a production bottleneck, then equipment utilization becomes an important consideration

and should be included in the incentive formula. There may be a direct relationship between labor and equipment utilization, as is frequently the case in production shops where one man is assigned to one machine. It may not be true and in fact may be just the opposite in the case of large expensive machinery where a number of workers are assigned to one unit.

For instance, a paper-making machine or a strip mill may show low actual labor utilization because part of their operating labor, while not necessary during the ordinary running of the equipment, is kept there as a reserve in case of break-downs, interruptions or changes, when it is highly desirable to reduce the down time of that equipment to a very minimum. Labor productivity would be increased by reducing the crew and this could be done quite readily, but it would increase the delay time experienced during break-downs, changes, or periods



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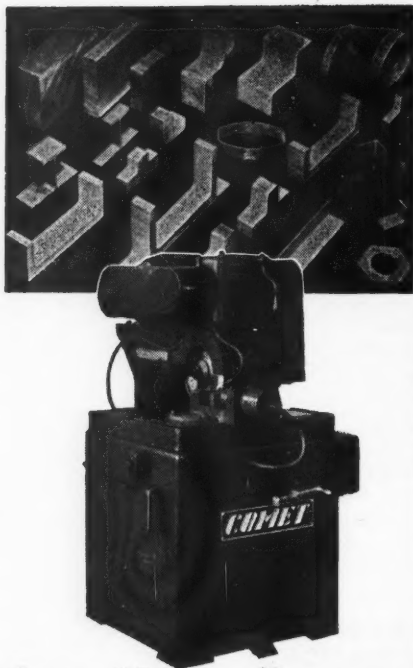
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of adjustment of the equipment, and the loss thereby, because of the very large investment value, would be many times greater than the labor saved.

It is generally possible to predetermine what constitutes a reasonably good capacity production for the equipment and a corresponding factor can be introduced by comparison of actual output to that predetermined standard output. This factor can be brought back to a cost relationship by figuring the gain or loss in production as so many machine hours at the standard rate of production. The machine hours have an accounting dollar value related to investment, rate of obsolescence and depreciation, maintenance costs, and so on, and therefore provide a corresponding dollar gain or loss.

The determination of equipment capacity should include recognition of legitimate reasons for variations in the expected output, with proper allowance for changes, unavoidable delays and adjustments. The effective running time and capacity of a paper machine or of a strip mill will be less with small runs than otherwise. In some cases, such as with printing machinery, the make-ready time may well exceed that of the run.

Materials

Data relating to materials or yield should enter only when there is a chance of substantial loss or gain. In certain processes this factor may be subject to considerable variation, depending upon care, attention and skill. The cutting of materials of irregular uniformity into a variety of patterns, for example, affords such possibilities. If not already known, standards representative of reasonably good yield can be established by actual tests, the difference between this standard and the actual result constituting a positive or negative cost credit.

Leather and lumber cutting are typical operations in which this factor

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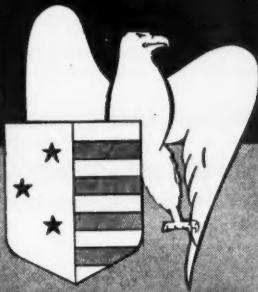
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is important. It is less, but still important, in the cutting of more uniform materials such as cloth, sheet metals, and so on. If yield is closely tied with quality, as in meat, vegetable and fruit processing operations, it might be best to provide control but not an incentive on that score, unless a very positive control of quality can be ensured.

Quality

Quality is always a factor, and sometimes of major consideration. In many cases the degree of quality can be positively determined because it is based upon definite dimension, tolerances or other measurable physical characteristics. In other cases quality is predominantly a matter of judgment. Appearance, degree of finish, flavor, taste, feel, and so on, are subject to human variations, although a continuous effort is made to replace that variable human judgment with

more positive controls.

Whatever the process of determination of acceptability or non-acceptability of the product, a figure representing what is considered a reasonable percentage of defective work can be determined and priced and the actual results can be related to this figure. When the determination of good and bad is more or less indefinite, it is advisable to establish a standard neutral range within the limits of which there is neither penalty nor credit. The same can be done if the cause of the rejects is indefinite. If it is so indefinite as to make possible great variations in results regardless of departmental skill and application, it will be best to leave this feature out altogether.

Other Factors

The influence and importance of labor productivity has already been discussed, but there are other factors

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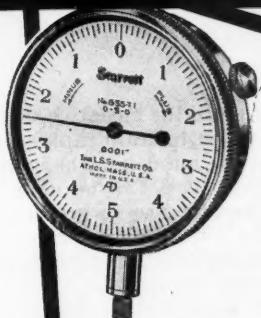
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related to labor productivity which should be considered by themselves. For example, employee turnover and lack of skill of beginners often materially affect labor productivity. Everything else being equal, the foreman's attitude and ability may minimize turnover, but no foreman can help the necessity for additional workers if there is a sudden increase in production schedules. When operations require skill and experienced workers are not available, the effect of a large influx of beginners may be very substantial and bring a previously high productivity index down to or below standard.

Since, under these conditions, the foreman is likely to have a lot more work to do than before, it is advisable to provide an allowance to make up for the expected loss in productivity. It is better to predicate that allowance on the variation in the volume of production rather than on the actual number

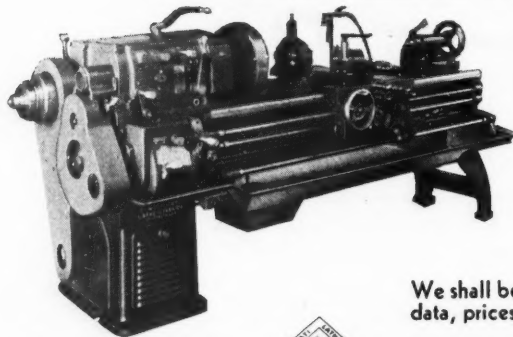
of beginners, since the incentive should spur the foreman to train rapidly but also to keep the number of beginners at a minimum. This can be done by combining the increase in production from week to week with a reasonable figure of productivity for beginners from one week to another.

Perishable tools and supplies may or may not be an important factor. If an opportunity exists for substantial gains or losses, standards can be established representing a normally good expectation for various production rates and conditions and the difference between such standards and the actual cost figures will represent the gain or loss.

The same reasoning applies to other factors of controllable expenses such as heat and power, maintenance and repairs, always keeping in mind that unless there is a worthwhile possibility for a gain or loss, those factors should be ignored.

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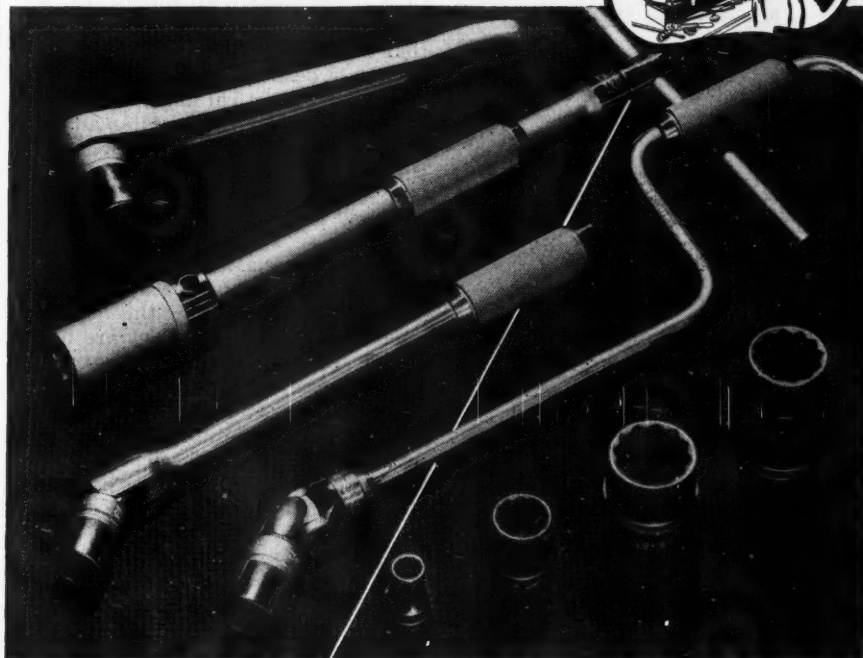
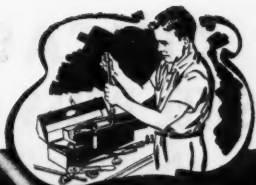


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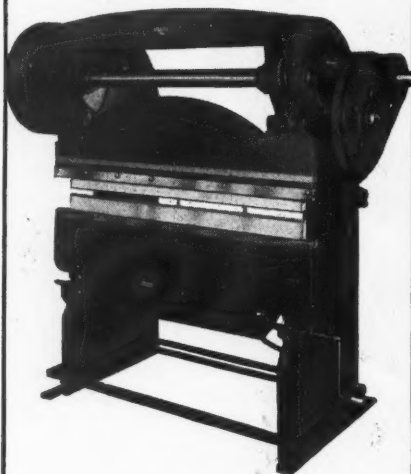
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Accidents

Regarding accidents, there should always be a strong inducement to any supervisor for respect and enforcement of all safety rules and precautions. Even though all supervisors are expected to do everything possible on that score with or without an incentive, it is desirable both from psychological and practical angles to include preventable accident costs as an item of excess cost of operations, either at their full or at a reduced value.

Industrial Relations

Industrial relations are difficult of measurement and are rather a matter of judgment, except for the fact that good or bad labor relations are likely to be reflected in productivity and costs. These already-discussed factors therefore serve as a partial measure of a supervisor's ability and performance on that score. The rest, if purely a matter of other executives' judgment, should not enter into consideration of the incentive formula.

Cooperation

A similar point of view is indicated as regards cooperation. All supervisors should be cooperative, but it is seldom possible to measure cooperative values as such. With most men, a reasonable and sound incentive will stimulate a spirit of cooperation, understanding and general good will. This is the result of satisfaction created by a correct evaluation of personal accomplishments and by the fairness of the reward attached to this evaluation. The more clear-cut the limits of individual responsibilities, the better, and if all individual supervisors do their utmost within those specified limits, the better will be the total result.

However, there may be cases, particularly in the smaller organizations, where responsibilities are bound to

BEARING FACTS NO. 4

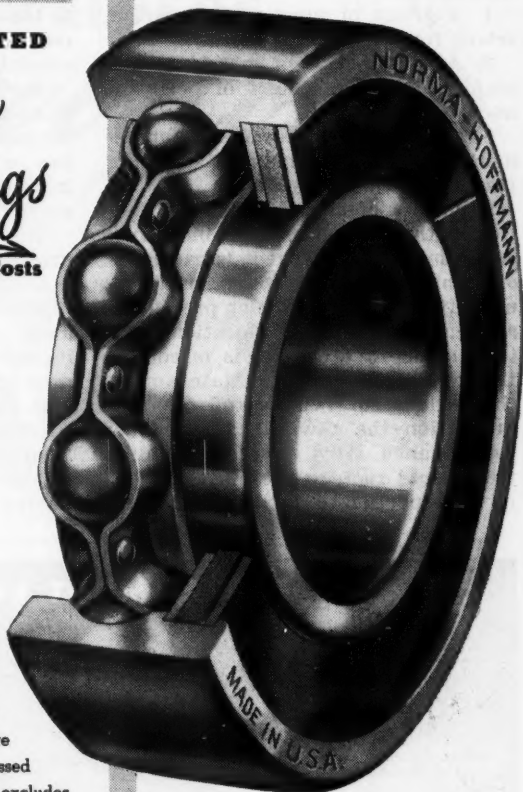
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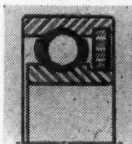
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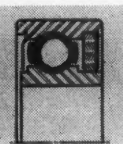
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overlap and where a broader interest may be beneficial.

Alternative solutions for such special cases are:

1. A group or plant-wide incentive set-up for all supervisors.

2. A combination of individual and plant-wide measurement of performance.

3. Individual measurement supplemented by a plant-wide profit-sharing plan.

A plant-wide method would be identical with that followed for individual supervisors except that it is based upon plant rather than departmental figures. It provides a simpler procedure, since no departmental allocation needs to be made. Its drawback is, of course, that it does not differentiate among the various supervisors and does not proportion the reward to individual performance. This "everybody alike treatment" reduces the incentive value in proportion to the number of supervisors involved; the greater the

number, the less effective it is. If the number is small, a plant-wide plan, well conceived and well managed, may be reasonably satisfactory and has the real advantage of simplicity and easy administration.

The combination individual and plant-wide measure needs no particular explanation. The measured indexes can be combined with equal weight or in proportion to payrolls, or in whatever other proportion seems justified.

The combination of individual measurement and plant-wide profit-sharing is a variation of the above where profit replaces the measure of plant performance, and provides whatever all-inclusive inducement profit-sharing may provide under the circumstances. The difference is that profits rather than performance-values influence the financial reward. This protects the Company against the possibility of paying substantial bonuses in bad



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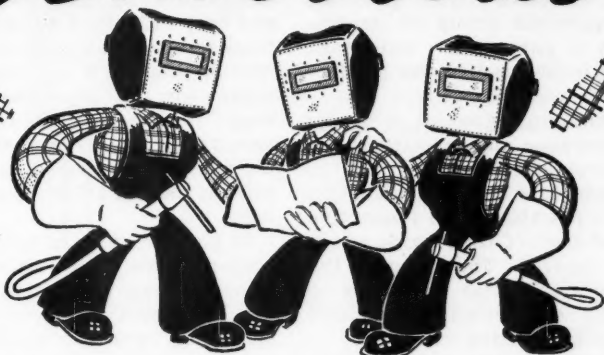
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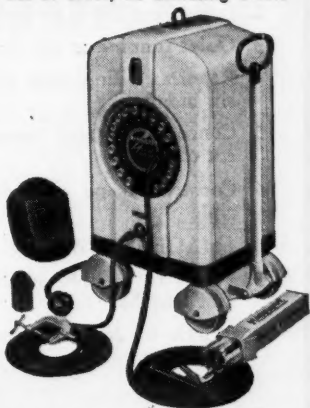
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times, but has the basic weakness of all profit-sharing plans in that the beneficiary frequently has little or no real influence on profits, although he may have considerable influence on costs.

Coverage

Another consideration is the percentage of effective control provided for the supervised group or department. This is particularly important when there is an incentive for production workers.

The maximum degree of coverage is desired because any production not under control standards is likely to offer a loophole for abuses. Production workers are not able to earn incentive pay on that part of their work which is not so covered. This reduces the total wage possibilities and leads to demands for the payment of incentive wages on non-incentive work.

The coverage factor can be intro-

duced in several ways, but perhaps the simplest is to arrange so that the incentive pay is figured only on a percentage of the supervisor's time or pay equal to the percentage of the total operating costs of a department that is actually under standard control. This means that if the payroll cost of a department is, say \$10,000, and all other operating expenses total \$15,000, and only \$12,000 or 80 per cent of the total is covered by standards of production, cost and expenses, then the supervisor or supervisors involved would receive only the corresponding percentage, in this case 80 per cent of the incentive pay which they would receive if the full \$15,000 was under control.

It may be said, in connection with such practice, that although the supervisor is not necessarily responsible for this partial coverage, no one should be expected to receive incentive pay for unmeasured performance

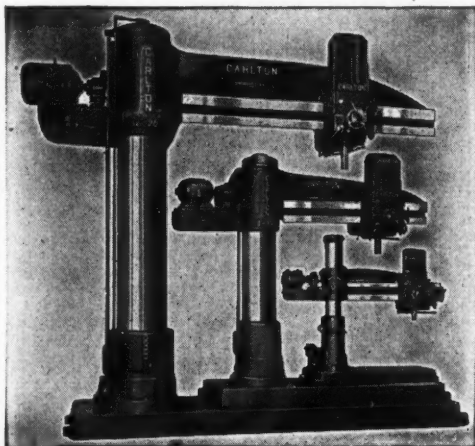
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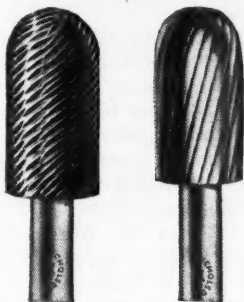
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since no one can tell whether that performance is above standard and therefore no one deserves any incentive pay, especially since the probabilities are that it is not.

Method Improvements, Technological Advances, and So On

At all times, but more particularly now when the labor picture has become more clouded, it is an important function of the supervisor to devise or promote or facilitate improvements in methods, in designs, or other elements of production, and which are generally known as technological advances. It is frequently possible for a foreman to effectively encourage and support the inventive spirit of his employees, in addition to whatever he may be able to contribute himself. This is true whether or not there are other special provisions, such as suggestion bonus plans.

It is also important that the supervisor facilitate and support the application and development of new ideas. These considerations therefore should be substantially implemented in any supervisor's incentive by providing a credit for any and all technological improvements made within his sphere of influence. This credit should be given regardless of with whom and where the new ideas originate, for it is desirable to promote a spirit which will encourage creative thinking among the many workers as well as among the fewer foremen and executives.

This spirit is even more desirable when an incentive wage is applied for workers, because many technological improvements result in, or call for, reduced man-power needs, and the immediate effect might be to lower the average productivity index of the department. If this happens, a supervisory incentive reward tied to productivity and cost may suffer, at least temporarily. It is therefore advisable to arrange so that such a setback may



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be avoided and it is all the better if, instead, the supervisor is given a credit proportional to the importance of the improvement made.

One way to accomplish this end is to credit the supervisor with a substantial portion of the benefits derived from the improvement in production and cost for a certain period of time, or for the equivalent production that has taken place in a previous 1 month, 2 months or 3 months period, or again, for the production that is expected in the next 1, 2 or 3 months period.

Welding Technique. A revised edition of its bulletin "Ampco-Trode Welding Technique" is announced by Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4, Wis. The new edition covers welding with aluminum bronze electrodes using the carbon and metallic arc methods. Illustrated with 22 photographs, sketches, and diagrams, the bulletin contains a comprehensive weldability chart for cop-

per-base alloys, listing 33 bronze alloys, their chemical composition, physical properties, and detailed weldability data. In addition, the bulletin contains tables of recommended currents and voltages. Copy is available free by requesting Bulletin W-2A.

Detroit Center Drilling Machine. A two-color four-page bulletin on its center drilling machine for drilling concentric centers in a wide range of stock prior to subsequent machining operations has been issued by the Detroit Tap & Tool Co., 8432 Butler Ave., Detroit 2, Mich. Described in detail are the single lever control for the complete centering operation, as well as the automatic positioning, clamping, and releasing mechanisms. Machine capacities as to range of bar stock and forgings, as well as complete specifications, are included. Illustrations comprise views of the machine in full length and close up, detailing the center drilling operation together with the automatic positioning and clamping.

Copy of Bulletin DCD-1 is available free to individuals addressing requests on their company letterheads.

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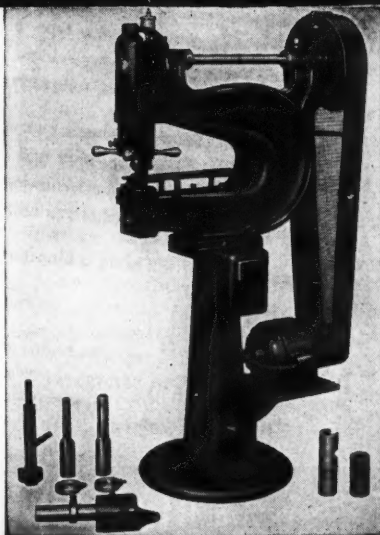
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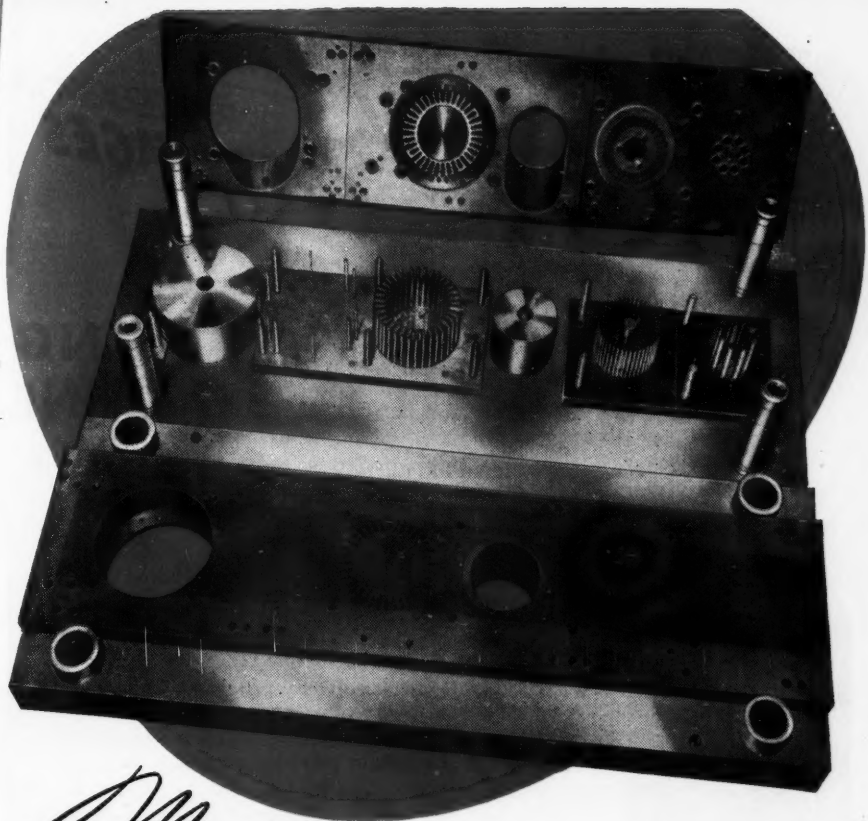
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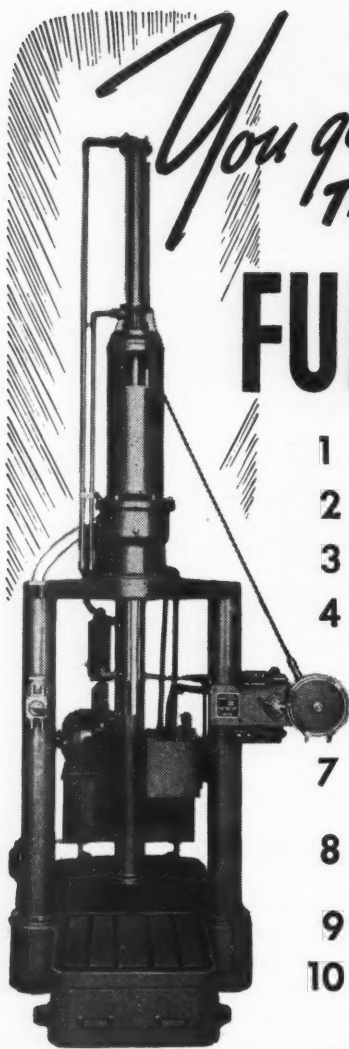
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Machining Wrought Aluminum Alloys

By E. R. YARHAM

England

THE machining of wrought aluminum alloys has developed greatly in England during the past few years, but although they may readily be machined, the technique required differs in certain respects from that used for machining the other common engineering metals. This article presents the experiences of some of the leading British companies whose activities embrace this aspect of machine shop practice.

The machining properties of wrought aluminum alloys vary with composition and hardness and, while a number of operations can be carried out with tools used on other metals, it will be found that the best results will be obtained using the tool angles and shapes recommended.

The general principles of tool design include the grinding of large top and side rake angles, keeping the cutting edges sharp and free from burrs, and seeing that the surfaces of the tool are free from grinding marks and scratches before beginning the ma-

chining operations. Exceptionally high speeds can be used on aluminum alloys, and in a number of cases, such as turning and milling, the speed of operation is limited only by the speed of the machine itself. Machines should be free from vibration and tools from chatter, otherwise a high surface finish will be impossible to obtain and the surface of the work will appear rough and uneven. To obtain the best results, tools should be clamped as close to the cutting edge as possible.

Properties

Owing to their complex structures, wrought aluminum alloys possess considerably better machining properties than does pure aluminum, and in the case of the heat-treatable alloys, a smaller cutting angle, depending on the hardness, is permissible.

The general properties of aluminum alloys which are of importance in machining are:

(1) High Thermal Conductivity. The heat generated by turning is rapidly conducted away from point of cutting tool.

(2) Lightness. The lightness of the stock reduces inertia forces when machining large stock such as forged or extruded bars.

The author is indebted to the (British) Wrought Light Alloys Development Association for permission to report on these developments in British practice in the machining of wrought aluminum alloys. The data embodies the experience of many prominent firms, including Rolls-Royce Limited, Bristol Aeroplane Company, Sir W. G. Armstrong Whitworth (Aircraft) Limited, A. V. Roe Limited, Dowty Equipment Limited, Wadkins Limited, A. C. Wickman Limited, B. O. Morris Limited, Brooke Tool Company and A. C. Wickman Limited.

TABLE I
SPEEDS AND FEEDS FOR MACHINING ALUMINUM ALLOYS
Cutting Speed (Ft./Min.)

Operation	Type of Alloy	Roughing	Finishing	Feeds
High-speed Steel				
Turning.....	Soft	900-1,500	1,500-3,000	Roughing up to 0.020 in./rev.
	Hard	Up to 600	Up to 2,000	Smoothing 0.004—0.010
				Roughing 0.007—0.020
	Silicon alloys	200	200-300	Smoothing 0.002—0.100
				0.002—0.004
	Tungsten Carbide			
Soft	Up to 7,000	Up to 7,000	Roughing up to 0.012	
			Finishing 0.004	
Hard	500-800	700-1,000	Roughing 0.008	
			Finishing 0.005	
Silicon alloys	400-550	500-750	Roughing 0.008	
			Finishing 0.004	
High-speed Steel				
Milling.....	Soft	700-2,000	Up to 5,500	Feed varies from 0.004 in. to 0.10 in depending on the hardness of the alloy and cutting speed
	Hard	1,500	Up to 6,000	
	Silicon alloys	2,000	
Carbon Steel				
Drilling.....	Soft	Up to 500 ft./min.		Up to 0.01 in./rev.
	Hard	Up to 400 ft./min.		
	Silicon alloys	Up to 200 ft./min.		Up to 0.005 in./rev.
		Tungsten Carbide		
		Up to 1,000 ft./min.		
Reaming.....	Soft	200	Roughing 0.010—0.030 in./rev.	
	Hard	65-80	Finishing 0.003—0.010	
Boring.....Light duty. Maximum speed of the machine				
Heavy duty, with flat boring drill: 100-160 ft./min.				
with boring bar: 65-80 ft./min.				
Tapping and Screwing—Soft: 130 ft./min.				
Hard: 50-60 ft./min.				
Sawing.....	Circular saw: 2,000-5,000 ft./min.			Depend on type of alloy and thickness of work
	Band-saw: Up to 5,000 ft./min.			

(3) The Low Modulus of Elasticity and Shear Modulus, which facilitate cutting and reduce the energy used in machining.

Aluminum alloys tend to form a built-up edge on the point of the tool, consisting of particles of aluminum which have partially melted under the heat generated in cutting and which adhere to the tool-tip. This characteristic is most pronounced with the softer alloys such as the aluminum-magnesium alloys containing 5 to 7

per cent magnesium, although it may also arise with harder alloys. It may be prevented by a liberal use of cooling fluid and by keeping the cutting edge free from grinding marks or scratches.

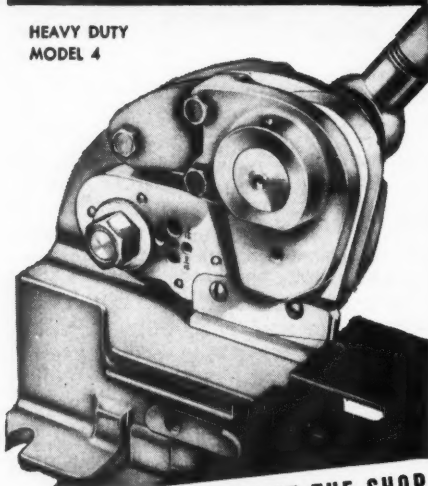
In all machining operations a plentiful supply of coolant is necessary in order both to lubricate the cutting tool and to cool the stock. The coolant should always be directed onto the tool rather than onto the stock. It should be noted that the coefficient of

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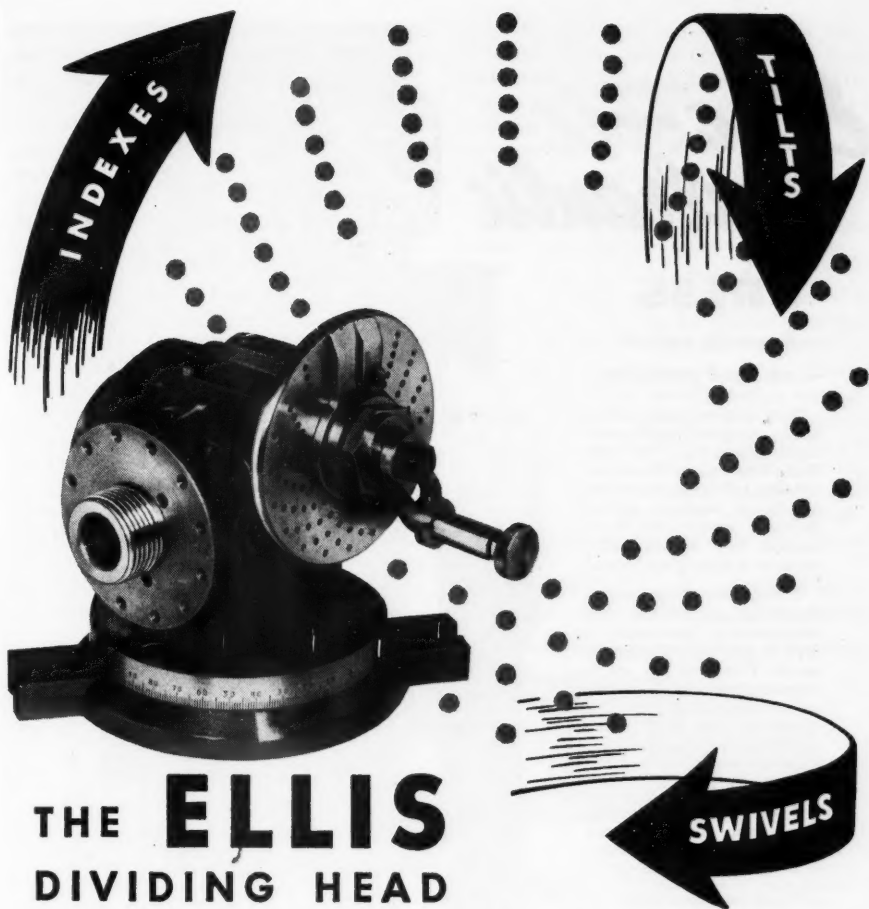
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expansion of aluminum alloys is approximately twice that of steel, brass or other metals commonly used for machining. Hence, if the rise in temperature is excessive, the expansion of the metal, when turning between centres, may set up serious strains in the machine. Where considerable machining has been done the work should be allowed to cool before calipering and gauging. For example, on a bar 1 in. in diameter a rise in temperature of 100 degrees C. increases the diameter by 0.002 inch.

Although the theoretically-ideal type of chip is a continuous ribbon, this type of chip is not favored in practice and, with the development of modern alloys having free-cutting properties, it is not practicable. The chips from the simpler alloys are often continuous, and care must be taken that these are directed away from the stock to avoid scratches, since the chips are harder than the original metal. Where long chips do occur in machining, they are directed away from the stock by allowing fairly generous top and side rake angles on the cutting tools. Special alloys have been developed that possess free cutting properties, but it will be found that in practice most of the modern alloys, owing to their complex structures, also possess this characteristic. Of the two main types of chip formation, continuous and discontinuous, the former are usually produced on the softer and more ductile alloys.

Cutting Tools

To obtain the best results, whether using plain high-carbon steel, high-speed steel or tools tipped with cemented carbide, special attention should be given to grinding. In the case of the first two steels, tools should be partly finished to the shape required, leaving a minimum amount of stock to be removed after hardening. Grinding should be handled carefully, remov-



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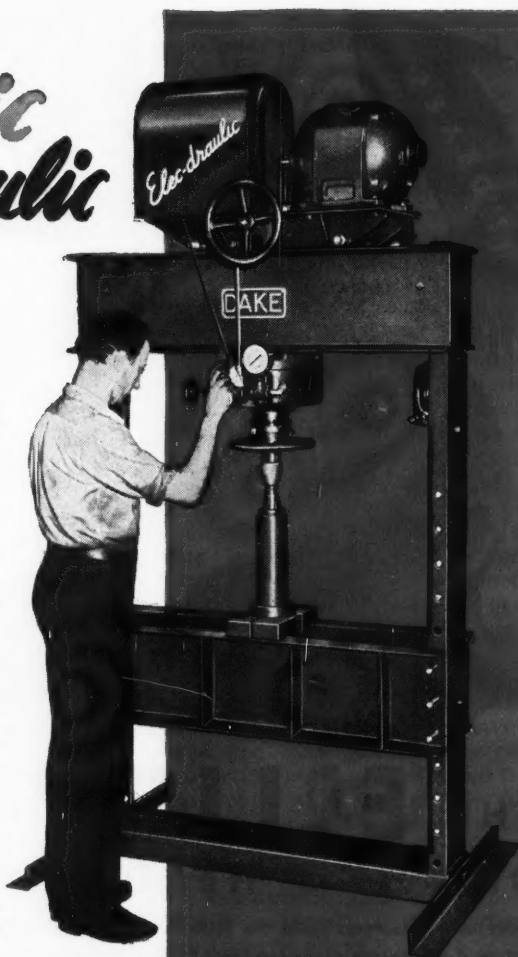
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This press is ideal for production, assembling, and straightening operations, as well as general maintenance work. Pressures are set or released from simple controls at the front of the press. A gauge at eye level speeds operation, and a special safety valve prevents overload.

Like all Dake hydraulic presses, this one has a rigid frame and movable work-head. It is available in either a 50- or 75-ton capacity.

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ing only a small amount of metal at a time to avoid overheating and thus softening the extreme tip of the tool.

The life of a tool is considerably increased by stoning after grinding, using India (alumina) oilstones, medium and fine, and finishing off with Arkansas stone. A few strokes of each is all that is required to remove the roughness due to grinding, which, incidentally, would be difficult to see without a microscope. Judicious stoning at the first sign of a dull edge will return tools to the original condition without regrinding, which would entail disturbing the setting.

Carbide-tipped tools offer an advantage since the cutting edges remain sharp over a longer period between regrinds, provided they are not used for heavy intermittent cuts, and a better finish is possible owing to the great hardness of the tool relative to the stock. They are particularly successful on alloys having high silicon con-

tent, the hard particles of which tend to cause rapid wear on ordinary tool materials. When taking multiple cuts, where there is any appreciable difference in diameters, it is necessary to use high-speed tools for the smaller diameter because the surface speed would be too slow for carbide tools.

When mounted, the tip may be ground to shape either wet or dry. Where a coolant is used, it should be applied lavishly in order to check the tendency of the tip to crack as a result of the heat generated by grinding. Grinding is carried out on a silicon carbide grinding wheel, which should grind onto the edge of the tip and not away from it to avoid the tendency of the wheel to rip the tip from its seat. To impart a super-finish, a diamond wheel or diamond hone consisting of diamond dust set in bakelite is used.

Diamond Cutting Tools have been the object of intensive scientific study



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only within the last 20 years or so, and used exclusively in special finishing operations such as piston-turning and in instrument work, where an exceptionally high finish is required. These tools are unsuitable for roughing work and any coarse turning should be done with high-speed or cemented carbide-tipped tools.

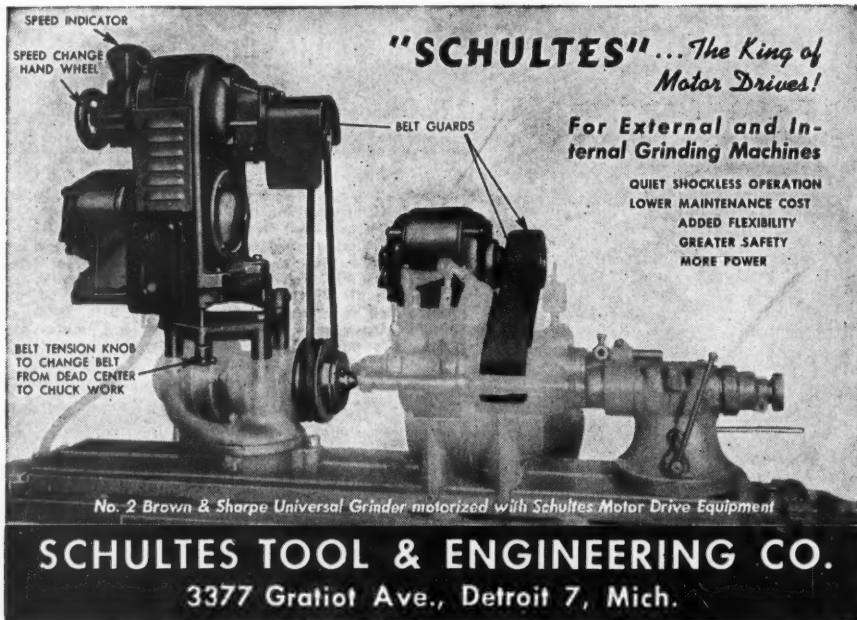
Diamond tools are usually made with either of two types of cutting edge, circular or faceted. Although the circular cutting edge type is now rarely used, it has the advantage that at whatever angle (in a horizontal plane) to the surface it is cutting, it operates with equal facility. Thus the tool can be started off cutting at one end of the arc and turned until the whole of the cutting edge has been abraded.

On the faceted type of cutting edge there may be as many as five facets, each varying in size from 0.020 to 0.060 in. The angle between two contiguous edges is about 170 degrees,

while the included angle between the front and top faces varies from 70 to 90 degrees. Cutting angles of 0 to 18 degrees are used and top rake angles of 0 to 10 degrees. If a negative rake angle is employed this should not exceed 6 degrees.

For turning ordinary stock, the tool should be set either on or, in the case of very large diameter work, slightly above the centre line. Similar conditions hold for internal work such as boring. Important in diamond machine tool practice are the rigid mounting of the tool and freedom from periodic oscillation in the machine.

As high turning speed as possible compatible with surface finish should be used. Surface speeds of 350 ft. per min. upwards are commonly attained. Feeds vary from 0.008 to 0.004 in. per rev., and hand feeding is not advisable. In general, the maximum amount of metal that should be removed varies from 0.010 to 0.020 inch.



The advertisement features a detailed illustration of a motorized grinder, identified as a No. 2 Brown & Sharpe Universal Grinder. The machine is shown from a side profile, highlighting its various components. Labels with leader lines point to specific parts: 'SPEED INDICATOR' at the top left, 'SPEED CHANGE HAND WHEEL' below it, 'BELT GUARDS' on the right side, and 'BELT TENSION KNOB TO CHANGE BELT FROM DEAD CENTER TO CHUCK WORK' at the bottom left. The machine is mounted on a sturdy base with a large flywheel and a grinding wheel assembly.

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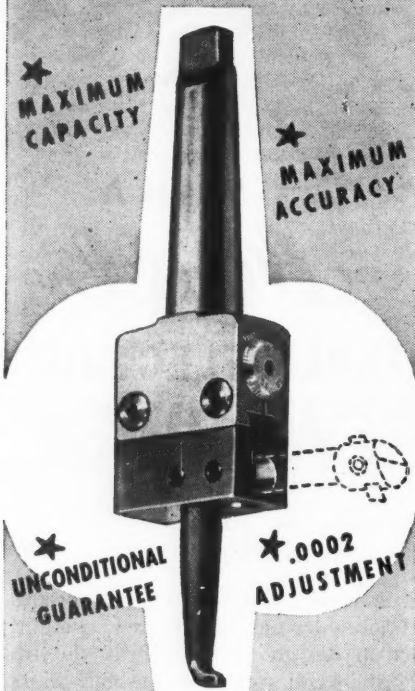
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Cutting Compounds and Lubricants

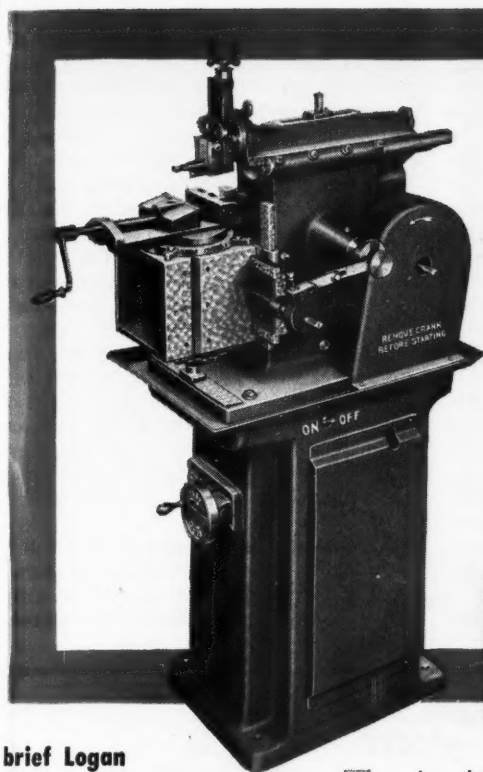
While many aluminum alloys can be successfully machined without the use of any cutting compound, some form of lubricant or cooling fluid is desirable.

Under unfavorable conditions, such as insufficient lubrication or a dull cutting edge, a built-up edge is formed by adherence of the alloy to the cutting edge. This difficulty usually occurs with the softer alloys, and is due essentially to a partial melting, at the point of the tool, of the material being turned. Alloys of high hardness and having a fairly complex structure tend to produce discontinuous chips while the softer and more ductile alloys produce a continuous type of chip.

In order to obtain a good finish all conditions should be directed towards reducing the built-up edge as far as possible. Cutting oils diluted with paraffin to reduce viscosity are used mainly as coolants and to reduce adhesion. In higher viscosities they are used for lengthening the life of the tool when heavy cuts are taken. They are also used on any machines in which a water emulsion would impair the lubrication of ways, guides, spindles, and so on.

Soluble cutting oils are normally used where cooling is of prime importance and where there is little need for reducing adhesion. These types of oils are also used in most grinding operations where there is a great need for cooling. In addition, a water emulsion allows minute grindings to settle out quickly and thus reduces scratching of the work. Soluble oils are also used on some drilling operations where a fine finish is not essential.

The cutting fluid has a considerable effect on the type of chip produced and serves the dual purpose of cooling the work and lubricating the point of the cutting tool. Where the speed of cutting is low, chip section heavy, and



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conditions such that chip flow is restricted (such as in drilling, threading and tapping), it is important that friction between the tool and the work is reduced to a minimum.

At high cutting speeds it is necessary to use a fluid with good heat-disseminating properties, to reduce the built-up edge to a minimum. Other properties which are of value in a cutting compound are:

(1) Good oxidation resistance, since cutting oil that is gummy holds small chips and abrasive and will cause excessive wear on the tool.

(2) Low waste loss. A suitable machining fluid should have the correct viscosity to insure against excessive loss resulting from too much oil being retained on the surface of the work.

(3) All cutting oils should be sterilized and free from bacterial organisms which might affect the operator's skin.

A satisfactory compound for gen-

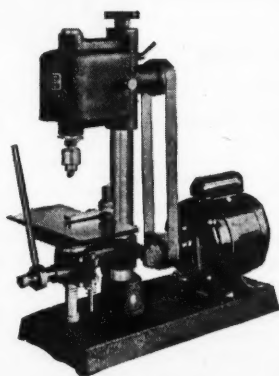
eral purposes consists of a mixture of lard oil and paraffin in varying proportions. A 50 per cent mixture is generally used for light work, but in heavy machining operations such as reaming or tapping, in which cooling is less important, a mixture containing a higher percentage of lard oil should be employed. For milling, sawing and drilling, the soluble cutting oils give the best results and are more economical than the paraffin-lard oil mixtures.

Some operators prefer to use the soluble cutting oils when machining castings as these oils do not tend to stain the surface in the same way as straight oil lubricants. For hand or machine reaming, petroleum, turpentine or a straight mineral oil should be used.

Soluble cutting oils are available that can be mixed with water in varying proportions (from 1 in 10 to 1 in 80), the oil being added to the water.

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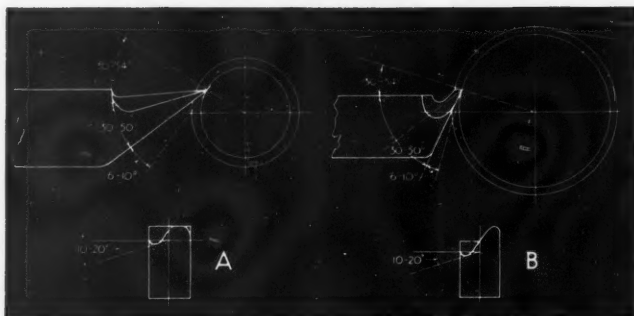


Fig. 1—Drawing illustrating method of grinding turning tool tips for (a) small diameter work, (b) large diameter work.

A stable emulsion is thus formed which can be used again after filtering. The neat oil can be used for heavy routing operations, the parts being dipped in the oil before the operation. Since the soluble oils contain a lower percentage of oil than the straight cutting oils, their lubrication properties are not so good, and they are not recommended for work in which heavy cuts and slow speeds are employed.

Tool Shapes and Operations

Tools for cutting aluminum and aluminum alloys have considerably more top and side rake than those used for steel. Clearance is important and should be carried around the side of the tool which advances into the work. A side rake of 10 to 20 degrees will materially assist in the cutting action, since it promotes slicing of the

angle as 60 degrees, in order to take full advantage of the free-cutting characteristics of the metal.

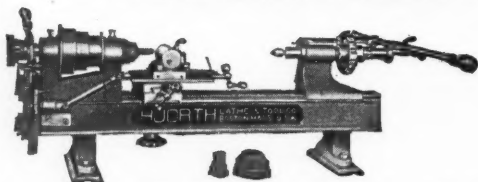
Keen edges are best obtained by finish-grinding with a fine abrasive wheel and then hand-stoning with a fine oilstone. Care should be taken that neither the angles nor the contours of the cutting edge are altered during grinding.

The top rake angle, sometimes called the "hook", owing to the hook-like appearance it gives to the tool, is the angle between a line drawn through the centre of the cutting edge and a line from the centre of the stock to the tip of the tool. The total included angle varies from 30 to 54 degrees, the higher angles being used for the softer alloys.

Clearance varies from 6 to 10 degrees, smaller angles being used with the softer alloys. The clearance angle is important and should be carefully

chips and thus causes the tool to cut more freely. Planer cutting tools may be ground with as high a side rake

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(Above) Boring the cylinder liner seats of a large diesel block.

(Center) Hard-to-reach surfaces such as this camshaft bearing saddle are easily milled by extending the machine spindle.

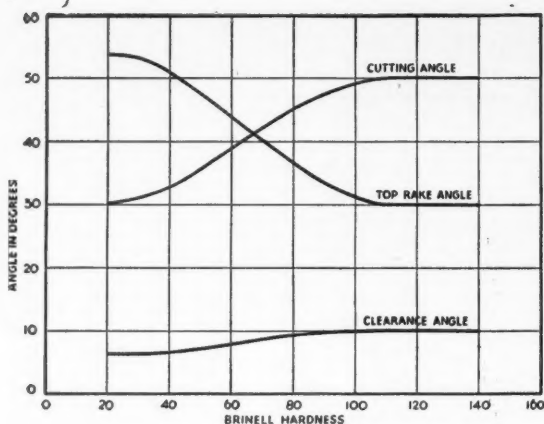
(Below) Boring seven main bearings simultaneously. Internal bar support fixture is used as shown in this manufacturing operation.

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Average cutting angles for turning wrought aluminium alloys with steel tools

Fig. 2—Diagram showing average cutting angles for turning wrought aluminum alloys with steel tools.

controlled. If the angle is too small, the tool will rub against the work and spoil the surface finish; if too large, it will dig into the surface and cause chatter.

The tool to cut more freely. It is claimed that increasing the side rake angle from 10 to 20 degrees to 30 and 50 degrees permits the use of a smaller top rake angle than is customary.



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TABLE II
PRINCIPAL CUTTING ANGLES USED FOR TURNING ALUMINUM ALLOYS

Alloy	Cutting Angle	Top Rake Angle	Clearance Angle	Side Rake Angle	Lubricant
Commercially pure aluminum	30°—33°	54°—50°	6°	10°—20°	Paraffin-lard oil
Non-heat-treated alloys	34°—48°	52°—32°	6°—10°	10°—20°	mixture or soluble oil
Heat-treated alloys	48°—50°	32°—30°	8°—10°	10°—20°	oil

The angles given apply only to ordinary steel tools and differ considerably for tungsten carbide tools, where the cutting angle should be not less than 65 degrees and a clearance angle of 5 degrees should be used.

The top rake angle may be reduced from 2 to 13 degrees for the harder alloys and the cutting angle correspondingly increased.

Shape of Cutting Tool

The tool angles obtained from Fig. 1 are in general a good basis on which to work, although they can be varied according to the merits of any particular job. For instance, best results are obtained by grinding the top rake of parting and similar tools with the grinding wheel parallel to the cutting face of the tool, the required angle being produced by the grinding wheel. When used in turning, the tool will then direct the chips away from the work, thus reducing the possibility of scratching the surface.

Variations in cutting angle and plain angle affect the horse-power consumed in cutting, a tool with a small rake angle consuming about twice as much horse-power as a tool with a 50-degree cutting angle (about 30 degrees top rake angle). The horse-power consumed also depends on the radius of the tool tip, a tool with a $\frac{3}{4}$ -inch radius requiring about 10 per cent more horse-power than the same tool with a tip having $\frac{1}{16}$ -inch radius.

Round-Nosed Lathe Tool. This tool

should be carefully set for correct clearance, otherwise the finish of the work will be spoiled. The same tool may be used for both roughing and finishing, but the edge must be carefully restoned and reset before commencing finish-turning.

The tool used for small-diameter work is set considerably higher on the stock than is usual for steel or brass turning. The best results are obtained when cutting edge is set at about 45 degrees above the center line of the work. Where much of the stock has to be removed, this may mean frequent resetting of the tool, but where there is some play in the cross carriage and lathe carriage, the tool will not tend to feed itself into the work as it might do if set lower. A side rake angle of 10 to 20 degrees, depending on the hardness of the work, will assist the cutting. The cutting tool used for large diameter work has the same cutting angles but is set lower on the work.

In Table II the cutting angles for different alloys are summarized, together with the appropriate cooling fluids.

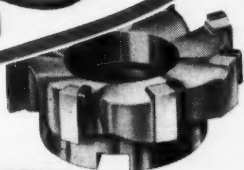
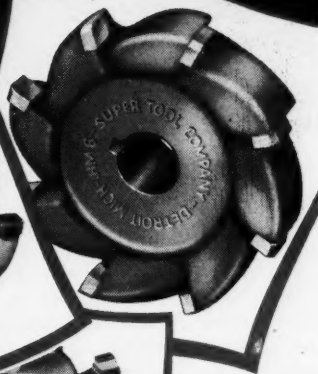
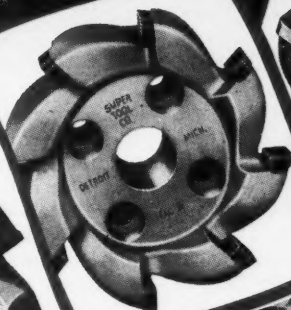
When making a cutting tool from ordinary rectangular bar stock, the tool should be designed so that there is ample metal to support the cutting edge. When mounting the tool in the holder, it should be held as near to the tip as possible in order to avoid vibration in the tool and in the lathe carriage.

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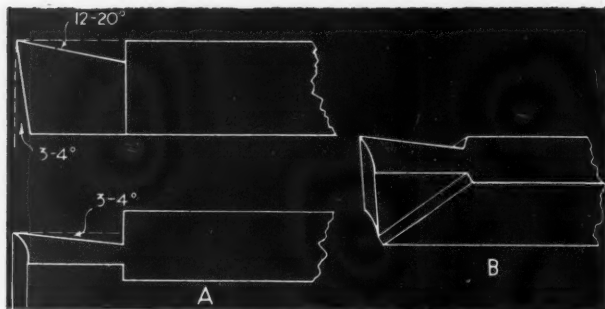


Fig. 3—Drawing illustrating method of grinding a Parting Tool by (A) the usual method and (B) an improved method which provides support on each side of the blade.

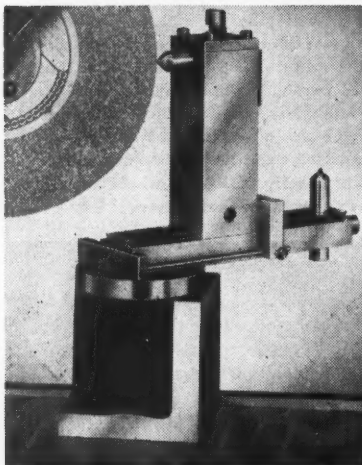
An improved type of tool bit is made from round stock and possesses certain definite advantages over a tool with a rectangular or square cross section, which requires extensive re-grinding and can only be used a limited number of times. The cylindrical bit can be made from ordinary carbon steel or high-speed tool steel suitably tempered and hardened. The end of the tool is ground with a hollow on the

principal advantage of the round stock is that it can be resharpened by holding the bit by the shank in the chuck or collet of a tool-grinding machine or an engine lathe. The outside diameter is ground away until a keen edge is obtained and, after grinding, is lapped with a fine oilstone on the top surface. Mounted in a suitable holder, the same type of tool can be used for boring. Cutting angles are

top edge, and turned with a collar for mounting in a holder, so that it can be adjusted to different setting angles. The

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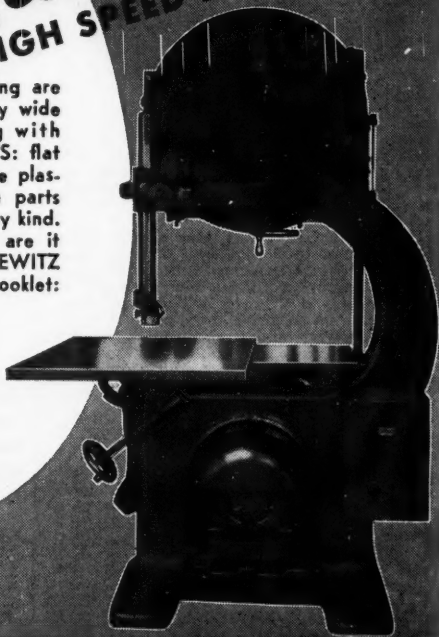
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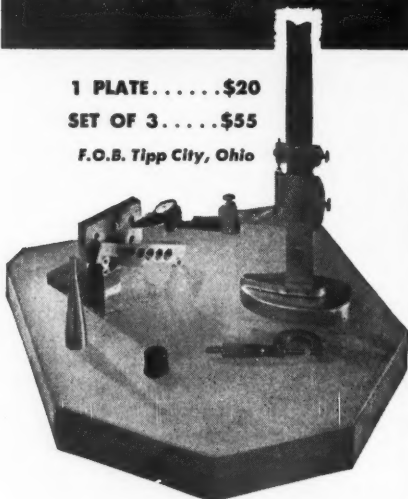
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the same as given in Fig. 1.

Parting. A top rake angle of 12 to 20 degrees is used, the smaller angle for the softer alloys, and a clearance of 3 to 4 degrees is provided in the front face. A side clearance of about 3 to 4 degrees should also be provided to prevent rubbing on the face of the work. The front face is ground slightly concave and the edge nearest the work is given a slight lead to cut the work clean, leaving the pip on the stock. Light feeds only, leaving a smooth, clean finish, without burrs, should be used.

Forming. Forming or profiling is generally carried out in one of two ways; (1) by means of a copying attachment fixed to the lathe and guiding the tool, or (2) by using a forming tool, ground to duplicate the contour desired and feeding in at right angles to the direction of rotation. In this second method a clearance angle of 15 to 20 degrees is necessary in order to obtain a good cutting action over the whole of the cutting face. The feed per revolution should be 0.002 to 0.005 inch. The lubricants required in forming operations are similar to those used in turning.

Piston Turning With Diamond Tools

The importance of a high-quality finish on the working surfaces of a large variety of engineering components is now generally accepted, and for this reason such parts as bearings, pistons and commutators are finished with diamond tools.

While aluminum alloys can be machined at exceptionally high speeds, the speed of turning with diamond tools is limited by other factors, such as vibration of the machine. Tests carried out on pistons finished by diamond turning indicate that there is an optimum speed and that this speed should be varied with the type of machine used. The limit is determined



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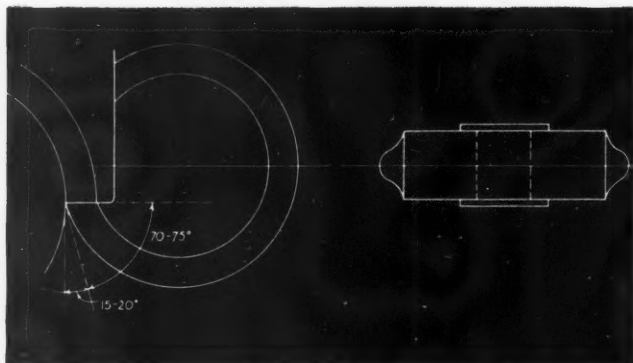


Fig. 4 — Drawing of Forming Tool ground to provide the required contour.

by the vibration set up during turning, the period of vibration being determined by the characteristics of the machine, the fixture and the work. At or above the critical speed, surface finish markedly deteriorates.

A machine used for diamond turning should possess the following features:

- (1) It should be free from vibration.
- (2) It should have a precision-lapped spindle operating in a plain bearing.
- (3) The spindle should have no end play.
- (4) Motors should be mounted independently.
- (5) Motors should be driven by an endless belt.
- (6) Motors should have the minimum of gearing.

Cutting Tools. A tool with a faced edge should be set with the cutting edge parallel to the work. If possible the tool should be set optically; failing this, an experimental cut will show, by the manner in which the cut widens out, in which direction the setting is faulty. The setting may again be checked by rubbing the finger along the work; for a correct setting, the feel should be the same in either direction. If the finish is not satisfactory, the height of the tool may be var-

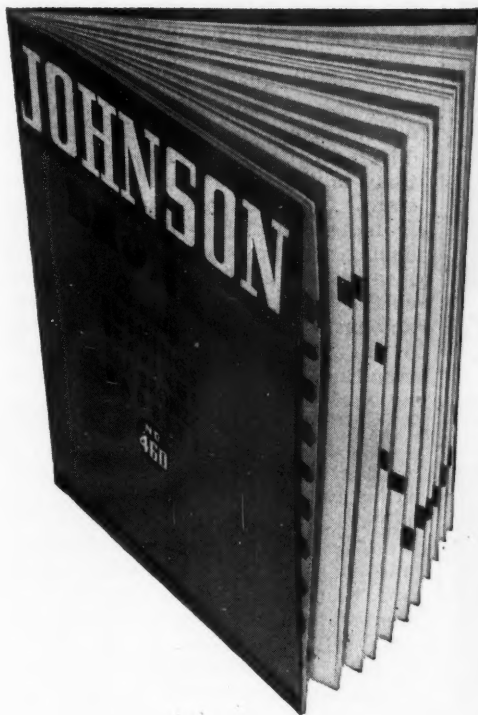
ied, though usually the tool is set as near to the center line of the work as possible. The width of the cutting facet should be approximately 0.020 inch to give the best results, and sharp corners should be removed from the end of the cutting edge. Tools should be lapped to the final accuracy required in the surface finish.

Speed, Feed and Depth of Cut. The lower limit of speed for turning is 350 ft. per min. On the production turning of typical aluminum alloy pistons, speeds of 500 to 1,500 ft. per min. are being used satisfactorily. Feeds vary from 0.0015 to 0.0035 in. The depth of cut must be reasonably light (0.001 to 0.002 in.), although 0.006 in. has been used without marked deterioration of the finish.

Lubrication. While a lubricant is not necessary for diamond turning, a cutting compound, such as lubricating oil, soluble cutting oil, or paraffin keeps the surface free from swarf.

Tests for Surface Finish Produced by Diamond Tools. Machines are available for measuring the surface finish (depth of cut in microns), but if such a machine is not available, the following tests may be used:

When rubbed with a thin piece of paper (i. e., cigarette paper) a poor surface will produce a thin whistling sound; a brilliant surface will produce no sound. A stethoscope fitted with a piece of ping-pong ball attached to the diaphragm may also be used. When



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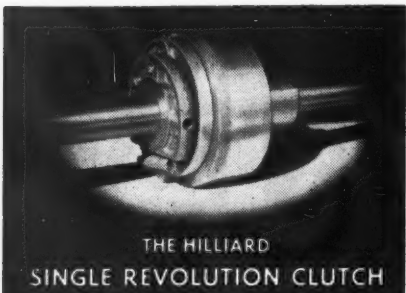
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the edge of the diaphragm is rubbed lightly over the machined surface, the volume of sound produced is an indication of the quality of the finish.

Milling. Since the cutting action is discontinuous, milling is essentially different from other machining operations, in which the forces remain constant. In the latter, the work is usually fed against the cutter, thus producing a comma form of chip. This means that at the beginning of the cutting action there is a certain amount of slipping between the tooth of the cutter and the metal surface, resulting in a hardening of the metal by working and causing wear on the edge of the tool.

This fault is eliminated in down-cut milling since the teeth of the cutter move in the same direction as the table. Care should be taken that the work is securely attached to the table, and backlash between the lead screw and bearings must be reduced to a minimum. Some machines are provided with devices which automatically take up all backlash, either mechanically or by means of a hydraulic feed, and in which pressure is maintained on both sides of a piston attached to a table, which is locked in the "stopped" position.

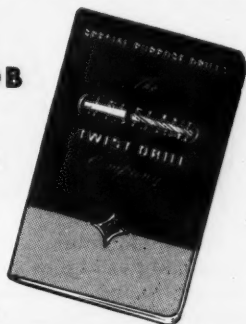
The power required for feed is less than in the normal method, since the cutting action assists the table traverse. The same kind of cutter is used as for ordinary milling operations. The angle between the cutting face and the point of cutting varies from 20 to 25 degrees. The cutting angle varies from 57 to 62 degrees. Clearance amounts to approximately 8 degrees. Faster cutting is obtained with a spiral type of cutter than with a cutter with straight teeth, since the cutting action of the former is progressive. The helix angle varies from 20 to 40 degrees, and clearance should not be greater than 8 to 10 degrees, otherwise the cutting edge will have insufficient support.

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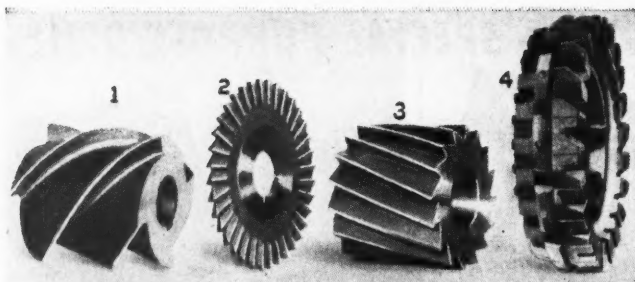


Fig. 5—Milling Cutters Used on Aluminum Alloys: (1) Helical Type, (2) Finning (Slitting) Type, (3) Plain Type, (4) Inserted Blade Type

Some aluminum alloys permit of machining at higher speeds than other metals, using cutters with greater tooth spacing which do not tend to clog with chips. Tungsten carbide cutters should be used whenever possible. Positive locking of the blades is desirable, and they should be backed so that they cannot push away from the cut.

When milling large surfaces, it is preferable to use vertical instead of

horizontal machines, since this clears the chips more efficiently and permits the use of large-size inverted tooth cutters. This type of cutter can also be adopted for tungsten carbide teeth. For extremely accurate work it is best to use a single point or fly cutter, previous roughing having been carried out by milling.

The following angles are used on tungsten carbide milling cutters:

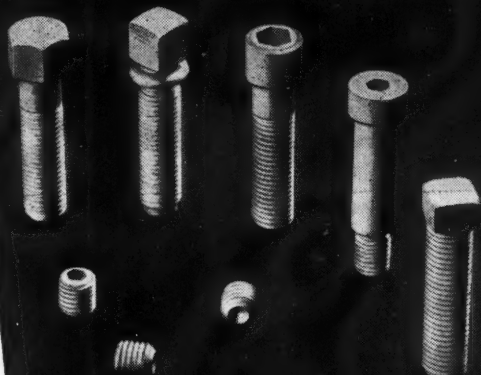
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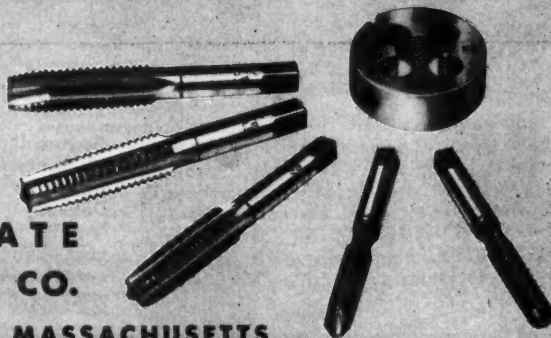
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TABLE III
MILLING SPEEDS AND FEEDS

Alloy	Cutting Speed (ft./min.)		Surface Speed (ft./min.)	Lubricant
	Roughing	Finishing		
Soft alloys	700-2,000	Up to 5,500	3-4	Soluble oil
Hard alloys	1,500	200	2 1/4-5	Soluble oil

The rates of feed in milling operations depend mainly on the speed of cutting. The following formula may be taken as a general rule:

Feed (in in./min.) = 0.020 to 0.030 x Cutting speed (in ft./min.). Under these conditions, the depth of the cut should not exceed 1 inch.

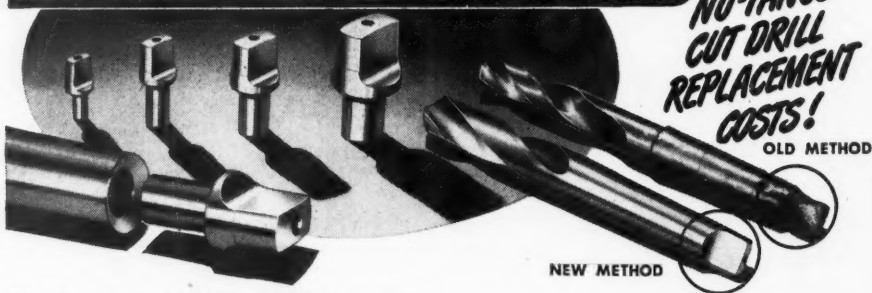
Milling Speeds and Feeds

Table III gives data for high-speed tool steel cutters. Where cemented carbide-tipped cutters are used, cutting speeds up to twice the above can be attained.

Spar Milling. The machining of aircraft wing spars up to 30 feet in length is now successfully accomplished. The machine employed consists of a series of three bed sections which support the work tables and a traveling cutter carriage actuated by a rack and pinion drive. It is essentially a heavy-duty machine and is fitted with a 30 to 75 h.p. motor driving the cutter through gears at speeds of from 100 to 1,200 r.p.m., with feeds of from 2 to 80 in. per minute.

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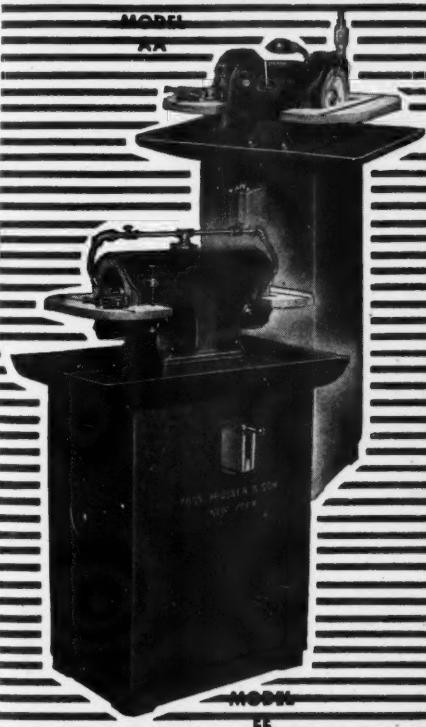
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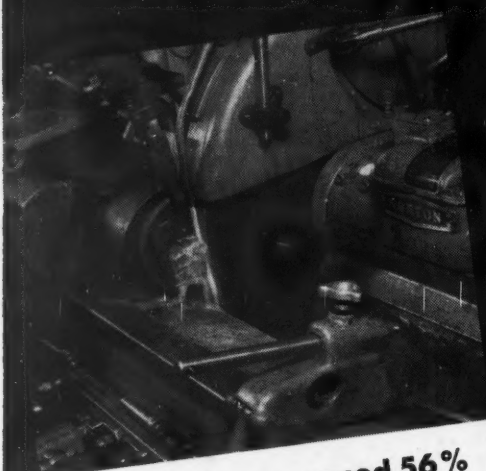
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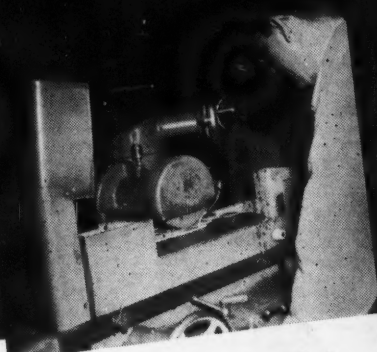
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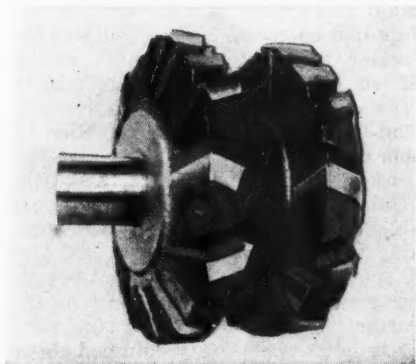


Fig. 6—Spur Milling Cutters with Inserted Teeth, Used to Mill Two Spars Simultaneously

ter is making a sinking cut, a low-speed motor is automatically switched in and the main motor is cut out. When the sinking operation is completed, the main feed motor is automatically brought into operation and the low-speed feed motor cut out. The cutter then travels fast over the uncut section of the spar.

Production Data. On a typical example of the kind of work that can be milled on this type of machine when using a 14-in. cutter with a cutting speed of 4,400 ft. per min., the total cutting time is 10 minutes. The limiting factor when using cemented carbide cutters is the horsepower of the motor, and in the example given it appears that higher cutting speeds could have been used if the power had been available. Furthermore, such cutters are more economical than solid cutters and will produce 100

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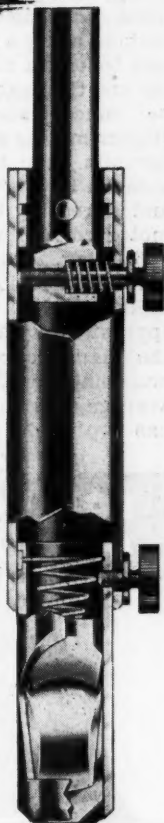
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Normal cutting angles are used on the cutter; the tendency to form a built-up edge can be considerably reduced by using a cutter with a negative rake angle, typical angles being 5 deg. on the hook and 4 deg. on the helix. Cutting is usually carried out without using a lubricant, as it is difficult to keep a cooling fluid on the cutter and the heat generated appears to be concentrated in the turnings. Higher milling speeds, up to 10,000 ft. per min., can be used by employing a cutter having a negative rake angle and increasing the horse-power of the motor correspondingly.

Routing. Routing is essentially a milling operation, using a high-speed milling tool as a cutter. Speeds of approximately 24,000 r.p.m. are used, the diameter of the cutter varying according to the type of work. An average cutter is 1 in. in diameter and has two teeth. The machine consists

essentially of a main frame, a table and a router head, the latter being either fixed or mounted on an arm.

With the fixed head type of router, the work to be cut is bolted to the jig. A former cut to the pattern required is attached to the under side and the work is guided on the machine by a pin passing through the bottom of the table and engaging with the former. Jigs can be made from wood and the former from ordinary sheet metal. Sheets up to $\frac{1}{8}$ in. in thickness in "Duralumin"-type alloy or aluminum-clad sheet are profiled or bevelled by this method.

In another type of router the cutter head is mounted on an arm which enables it to be moved over a wide area and swung through an arc of 350 deg. A fixed bush, mounted above the cutter and of the same diameter as the cutter, is used as a guide, the template in this case being clamped above the sheets which are to be cut. The

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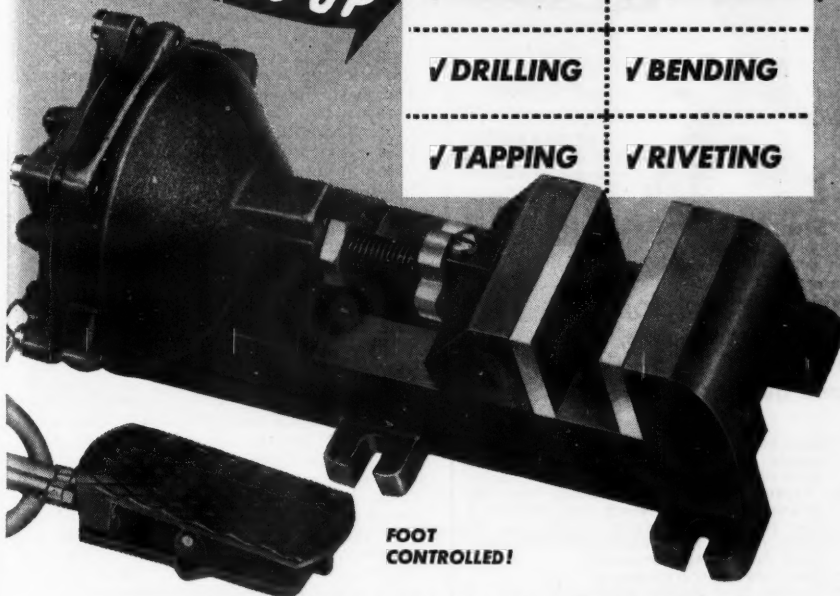
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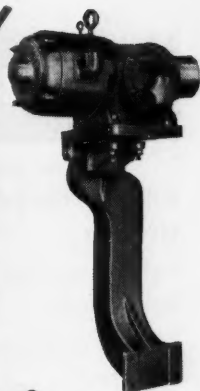
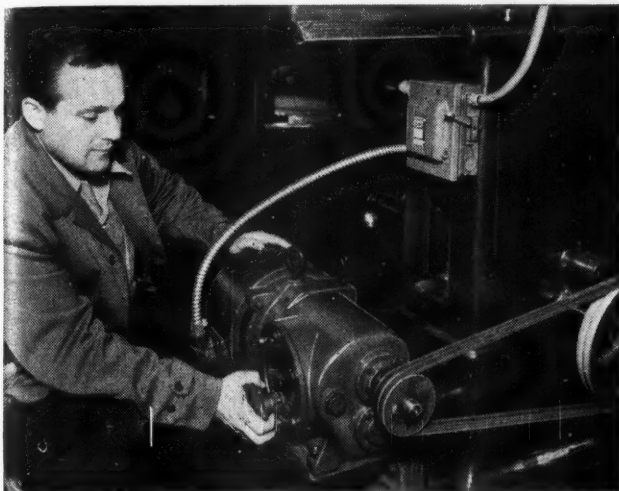
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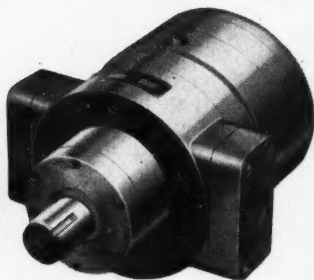
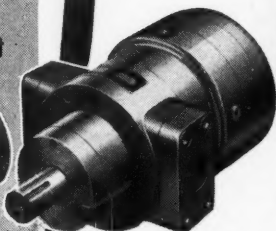
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Axial piston design lengthens service

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Denison HydroILic Pumps in this 3500 series are available in three models, delivering volumes of 6, 17, and 32 gpm. Write for complete details.



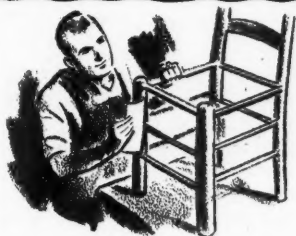
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How Many Teeth in a Carbide Cutter?

This brief article deals with a little-understood phase of steel milling with carbides — the determination of the optimum number of teeth that a carbide cutter should have for the best results. It provides a simple and practical method of selection, based upon practices currently in use in industry.

By CARL LEMAY

Test Engineer, Carboloy Company, Inc., Detroit, Mich.

WHEN preparing to start a new carbide milling operation, or when changing from high speed steel to carbide-tipped cutters, a number of factors must be considered. The life-expectancy of a carbide milling cutter is greatly affected by proper sharpening and sharpening schedules, correct positioning of the cutter relative to the work, and the reduction of vibration and chatter to a minimum through the use of flywheels wherever possible.

By utilizing the higher cutting speeds and heavier feeds available per tooth, full advantage can be taken of the capability of carbide-tipped milling cutters to remove metal at a vastly higher rate than is possible with equivalent high speed steel cutters. Since the rate of metal removal is directly related to the horsepower available, the first consideration in selecting a milling cutter should be given to the maximum speeds and feeds with which

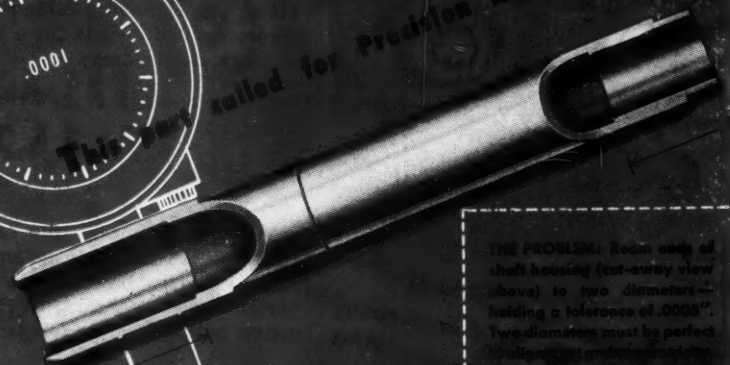
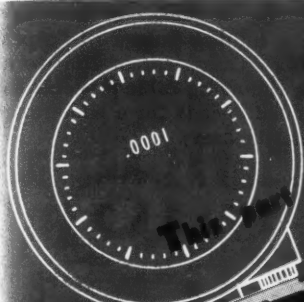
the cutter will operate efficiently, and the correct number of teeth in the cutter to fully utilize the power available without continuous overload.

The most efficient feed, speed and number of teeth that the cutter should have can be determined by a simple method that can best be illustrated by a practical example.

Let us assume that it is required to face mill to a depth of $3/16$ inch over a surface $4\frac{1}{2}$ inches wide by 10 inches long on a steel forging that has a Brinell hardness of 250. The machine to be used is equipped with a 10-h.p. motor to drive the spindle.

Cutter Size. The $4\frac{1}{2}$ -inch width of workpiece would permit the use of a 6-inch cutter.

Feed. To produce the maximum number of pieces per grind, a feed of 0.006 to 0.012 inch per tooth is generally acceptable. A figure of 0.010 inch feed per tooth could be used for estimating purposes.



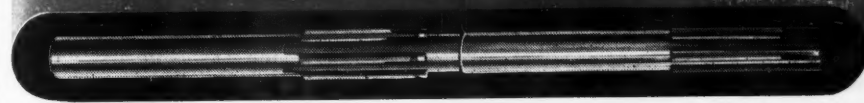
THE PROBLEM: Ream end of shaft housing (cut-away view above) to two diameters—holding a tolerance of .0005". Two diameters must be perfect.

STAPLES *Special Design*

CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS

CEMENTED CARBIDE

Solve Difficult Production Problems



This Staples special design step reamer proved the economical solution to the precision reaming problem shown above. Reaming operation was done in turret lathe. To obtain the perfect concentricity and alignment required, the rear section of the tool has a specially modified 90° end sharpening—this causes tool to cut with end milling action, thereby correcting misalignment between the two diameters present after drilling.

In the production of these shaft housings, this Staples reamer combined both reaming operations—maintained perfect concentricity

between diameters—held consistently to the close tolerances specified—and produced an excellent finish in the hole.

Staples *Special* and *Standard* tools provide the answer to economical hole production. If your production involves special tool designs, submit your specifications and part prints to Staples Tool Engineers—we welcome the opportunity to assist you to obtain maximum efficiency in precision hole production.

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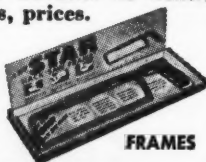


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FRAMES



POWER
BLADES



Speed. The selection of the best speed for a milling purpose is dependent upon the hardness of the work-piece. The following table presents the recommended speeds for a wide range of work hardnesses:

Brinell Hardness	Speeds in SFPM
150	530-660
200	450-570
250	400-500
300	350-450
350	320-400
400	290-360

For our example, this table shows that 450 SFPM would be suitable, but this speed may be varied as future experience may warrant. SFPM may be converted to RPM as follows:

$$\begin{array}{r} \text{RPM} \\ \hline 0.262 \times \text{cutter diameter} = \\ \hline 450 \quad \quad \quad 450 \\ \hline 0.262 \times 6 \quad \quad 1.572 \quad \quad = 286.2 \end{array}$$

Since the exact speed obtained by this formula is probably not available on the machine selected, the next higher RPM should be used unless the differential is too great. It can be assumed in this case that a speed of 310 RPM is available.

Number of Teeth. We are now ready to determine the number of teeth that the cutter should have to give the best results. The constant (0.6) in the following formula is equal to the approximate number of cubic inches of steel that can be removed per horsepower per minute. Assume that 80 per cent of the 10 h.p. available from the motor is delivered at the spindle. Then, for the feed per tooth of 0.010 inch:

$$\begin{array}{r} \text{No. of Teeth} = \frac{\text{Constant (based on dull cutters)} \times \text{HP} \times 0.80}{\text{Avg. Depth of Cut} \times \text{Feed per Tooth} \times \text{RPM} \times \text{Max. Width of Work}} \\ \hline = \frac{0.6 \times 10 \times 0.80}{0.1875 \times 0.010 \times 310 \times 4.25} \\ \hline = \frac{4.8}{2.47} = 1.9 \text{ teeth.} \end{array}$$

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Thus a cutter having 2 teeth is best suited for this job.

Table Travel. The table travel can now be determined:

$$\begin{aligned}\text{Table Travel} &= \frac{\text{Feed per Tooth} \times \text{RPM} \times \text{No. of Teeth}}{\text{Feed per Tooth}} \\ &= \frac{0.010 \times 310 \times 2}{\text{per minute}} = 6.2 \text{ inches per minute.}\end{aligned}$$

The actual feed used is selected from the next lowest feed available on the machine. Assuming that 5½ inches per minute table travel is available, the actual feed per tooth is then found.

$$\begin{aligned}\text{Feed per Tooth} &= \frac{\text{Table Travel}}{\text{RPM} \times \text{No. of Teeth}} \\ &= \frac{5.5}{310 \times 2} = \frac{5.5}{620} = 0.009 \text{ Inches.}\end{aligned}$$

As a check to make sure that available horsepower is not exceeded, the working data should now be substituted in the following formula:

$$\begin{aligned}\text{HP} &= \frac{\text{No. of Teeth} \times \text{Avg. Depth of Cut} \times \text{Feed per Tooth} \times \text{RPM} \times \text{Max. Width of Cut}}{\text{Constant (based on dull cutters)} \times \% \text{ of HP delivered at Spindle}} \\ &= \frac{2 \times 0.1875 \times 0.009 \times 310 \times 4.25}{0.6 \times 0.80} \\ &= \frac{4.45}{0.48} = 9.3 \text{ Horsepower.}\end{aligned}$$

The working data thus obtained is suitable for this job.

By following the method outlined above, full advantage may be taken of the high speeds and feeds made possible through the use of carbides for milling metals.

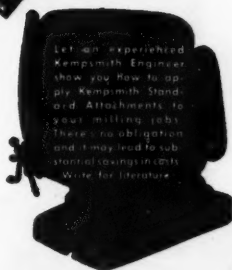
Champion Diamond Catalog. The Champion Diamond Co., Inc., 551 Fifth Ave., New York 17, N. Y., has issued a four-page catalog presenting illustrated, descriptive, and tabular information on its various diamond tools for the dressing of grinding wheels, as well as diamond saw blades, diamond wheels, diamond powder, diamond core bits, diamond casting bits, and other diamond products. Copy free upon request.



8 Quick Moves TO LOWER MILLING COSTS

Jump at the opportunity to reduce your milling costs by utilizing Kemp Smith standard attachments. These precision-built tools make it possible for you to convert your standard milling machine into a special purpose miller, thereby reducing costs to rock bottom. Kemp Smith Attachments, Arbors and Accessories have long proven their ability to handle both delicate tool room jobs and fast production runs. They have the same high degree of precision workmanship and accuracy characteristic of Kemp Smith machines for more than 57 years. It will pay you to investigate.

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Requires only a fraction of the applied pressure normally used for stamping—Thus preserving piece parts and adding to the life of your dies.

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The economy of rolled marking is self-evident, due to its speed and ease of operation.—HI-DUTY Machines are designed by us for practically any marking operation. It will operate efficiently from your plant air line and will give many years of satisfactory service, largely due to the care that went into its engineering.

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To Meet Your Requirements

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Ruggedly designed for modern production. All parts tooled for interchangeability — Spindle is forged steel and quill has bronze oil-groove bushings — Morse taper as well as table arm is bored in spindle after assembly — table surface held at right angle to spindle to .007 in 6 inches.

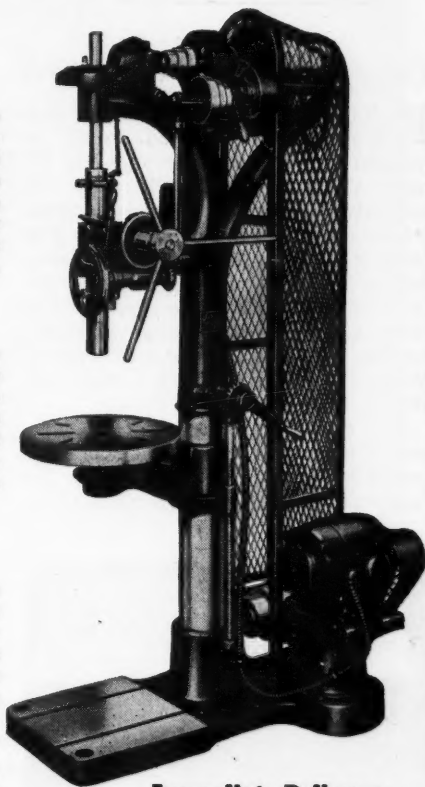
FOR SPEED

Convenient controls with long wearing designed mechanism speeds up operator handling — reduces fatigue and chance for spoilage. Table rotates on arm, and both swing on machined column for working space on base. Automatic feed trip operates through full spindle travel.

FOR CAPACITY

Power is delivered smoothly to give the Sibley 20" a capacity of 1 1/4" in cast iron or equivalent in other metals. Drive gears of 1:2 and large back gears of 1:4 ratios deliver ample power for every load — Castings are high-tensile, semi-steel. Motor drive is-cast integral with the machine base.

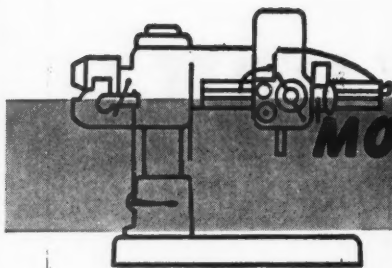
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MODERN EQUIPMENT AT WORK

Cement Stronger Than Steel

FATIGUE tests given two pieces of $\frac{1}{8}$ -inch thick duraluminum cemented together with new plastic adhesives have shown that the adhesives actually are stronger under bending stresses than is the metal itself. The tests were conducted by the Sonntag Scientific Corporation on a Model SF-01-U universal fatigue testing machine as a part of a series conducted for the American Society of Testing Materials at the Baldwin Locomotive Works, Philadelphia 42, Penna.

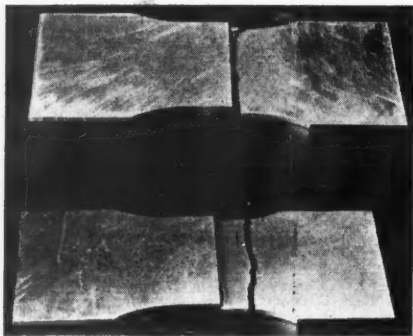
The adhesives tested were "Cycleweld," a product of the Chrysler Corporation, and "Redux," made by the Resinous Products and Chemical Com-

pany of Philadelphia. It is understood these adhesives are chemically very similar.

Fifteen specimens of 24ST aluminum alloy were used in the tests. Repeated alternating loads up to five million load cycles were applied to the specimens and in all cases except one the adhesive held while the metal itself fractured. The adhesive parted in only one of the tests.

These tests, which simulated actual service, indicate that it may be possible to use the adhesive to cement metal aircraft parts together rather than rivet them. Such practice could materially reduce the surface drag of airplane wings and fuselage.

The Baldwin Locomotive Works will supply further data to those who request it.



A new plastic adhesive used to cement two pieces of steel together proved stronger under bending stresses than the metal itself.

Man-Au-Trol Spacer Facilitates Small-Lot Production

THE illustration shows a Bullard Man-Au-Trol Spacer set up on a Cincinnati Bickford "Super Service" Radial Drilling Machine to facilitate drilling three different kinds of workpieces in a single drilling operation. The spacer is of 30 x 20-inch size, and the machine has a 6-foot arm on a 19-inch column.

In this set-up the machine drills

Less SET-UP TIME



More WORKING TIME

... FOR YOUR PUNCH PRESS WITH THESE DICKERMAN FEEDS

These accurate, automatic feeds require no connection with the power shaft of your punch press. They save labor time and material waste, both for day-in-and-day-out production and on short runs.

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1. Feeds from any position on any style die.
 2. Saves time on both long and short runs.
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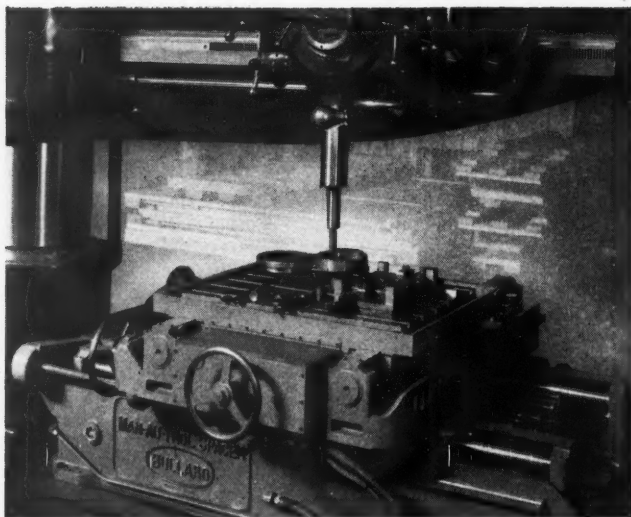
The Dickerman Die Feed

1. Handles coiled stock up to $\frac{3}{4}$ " thick, widths up to 4".
 2. Adjustable from 0" to its maximum feed length in increments of .001".
 3. Fasten three screws — and it's mounted on your die set.
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H. E. Dickerman Mfg. Co.

321 N. ALBANY STREET

SPRINGFIELD, MASS.



The Man - Au - Trol Spacer, set up on a Cincinnati Bickford Radial Drilling Machine, makes it possible to drill, counterbore and tap three different kinds of workpieces within close limits of accuracy in one operation.

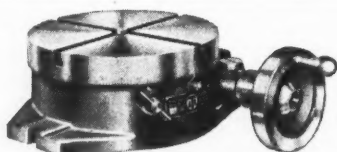
The set-up is ideal for small-lot production, facilitating accuracy and eliminating the need for jigs and fixtures.

seven $25/64$ -inch holes in a back gear case cover and counterbores them to $37/64$ inch, drills five $25/64$ -inch holes in a cup clutch and counterbores them to $37/64$ inch, and drills five $29/64$ -inch holes, one $5/16$ -inch hole and one $19/32$ -inch hole in a lower gear case pump cover, then counterbores the $29/64$ -inch holes to $41/64$ inch and taps one hole with a $3/8$ -inch pipe tap. All of the holes are located within plus or minus 0.0005 inch of the specified dimensions.

It is estimated that, with this set-up, 12 pieces an hour can be processed.

Forms for Making Calculations. The Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass., has published a series of printed forms for making calculations of measurements over wires for spur and helical gears. These forms are as follows: Form VK-101—Wire Measurement of Standard Spur Gear; Form VK-102—Wire Measurement of Spur Gear, Enlarged Pinions and Reduced Gears; Form VK-103—Wire Measurement of Standard Helical Gear; Form VK-104—Zahorski Method for Measuring Standard Helical Gear; Form VK-105—Zahorski Method for Measuring Enlarged or Reduced Helical Gear.

The forms are available at 5 cents per sheet or 25 cents for a complete sample set as listed above. They are also available in pads of 25 for each separate form.



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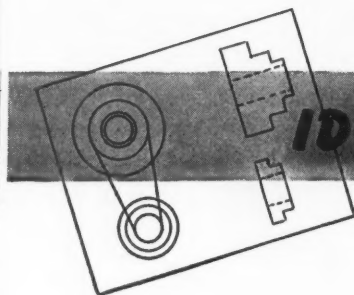
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IDEAS FROM READERS

Magnet Aids in Solving Transmission Problem

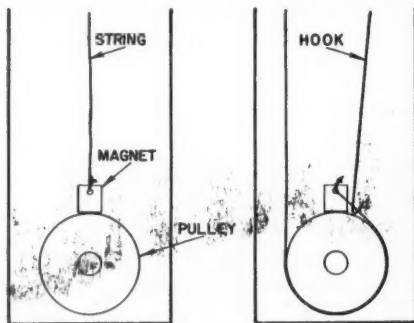
By HAROLD B. NOYES

THE problem illustrated in the drawing was one of those for which the solution is so simple that no one ever thinks of it. In this case it was necessary to rethread a new flat belt around a pulley on a home generator, and the difficulty consisted in that the pulley was located at the bottom of a hole that was too small to get into and too deep to permit reaching the pulley by hand.

The difficulty was overcome by attaching a string to a magnet, then lowering the magnet until it rested on

the pulley, to which it was held by the magnetic attraction. The pulley was then revolved one revolution, after which the magnet was retrieved by the use of a wire hook as shown in the illustration. With the string looped around the pulley, it was a simple matter to attach one end of the string to the end of the belt and pull the belt around the pulley.

A magnet is a very useful tool to have around, considering that it can be used to simplify many tasks that otherwise become most annoying, or even practically impossible. For instance, it can be used to retrieve small objects such as screws, rivets, or tools from the interiors of large, heavy machinery, or from otherwise inaccessible places.



Drawing Illustrating Method of Using Magnet to Thread a Flat Belt Around a Pulley

Spin Dimpling Tool

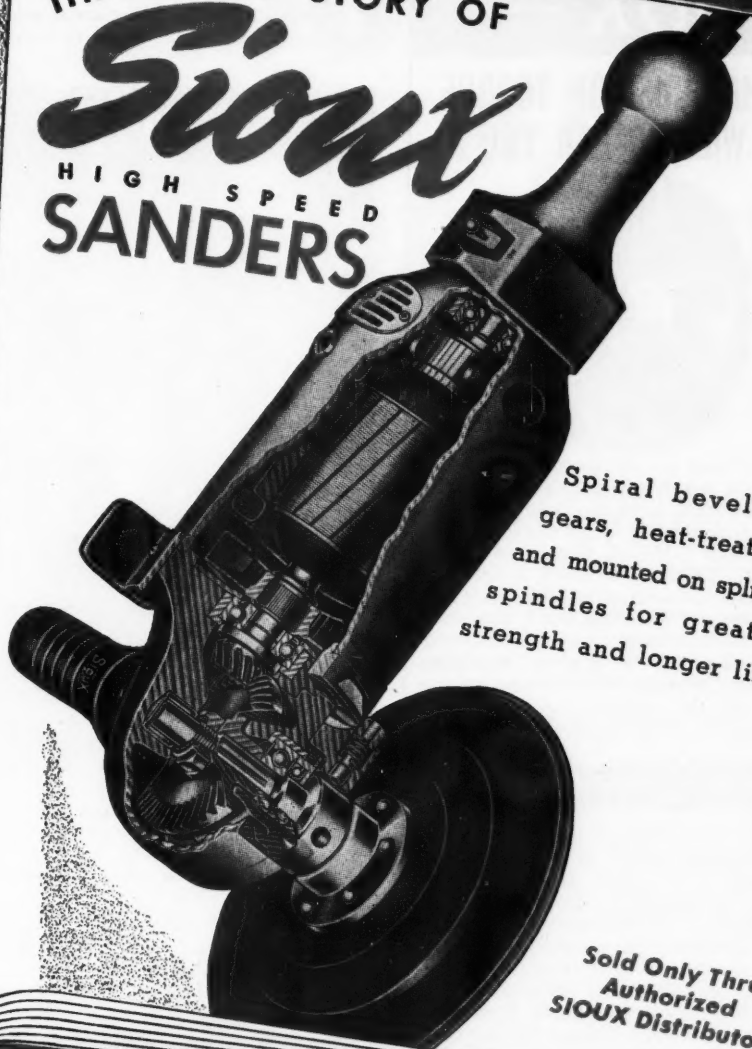
(Courtesy The Glenn L. Martin Company)

A TOOL designed for spin dimpling hard and brittle sheet metals such as Reynolds 301-T, Alcoa 75-ST and lightweight magnesium alloys has been developed by Herman E. Veit of the Glenn L. Martin engineering department. Adaptable for use in a standard drill press as shown in the accompanying illustration, the tool forms the dimple by spinning the met-

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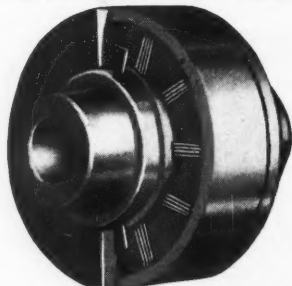


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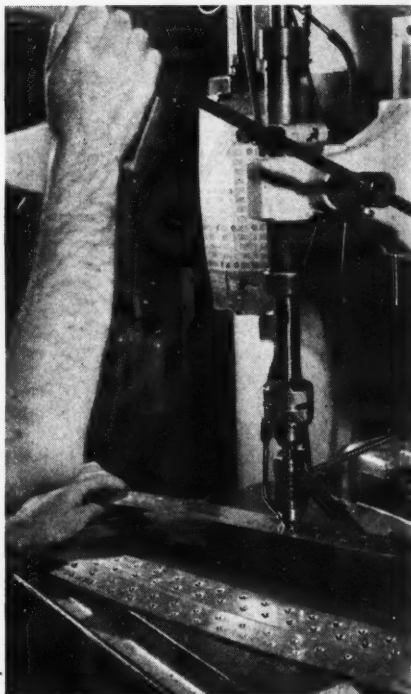
If you want steady, uninterrupted production — lower machine-repair costs and freedom from misalignment troubles, take advantage of the long-lived CUSHION TORQUE developed by the KANTI-LEVER COUPLING. It not only protects you against misalignment like the ordinary coupling, but it goes several steps further and cushions your Motors and Productive Machines against the wear, vibration and fatigue that are the source of most machine failures. No other coupling is like the—

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BROWN ENGINEERING CO.
120 N. THIRD ST. READING, PA.

al rather than by the pressing method used heretofore. In experimental use at the Glenn L. Martin plants, perfect dimples have been formed in both 75-



Forming a Dimple in 75-ST Sheet Aluminum with the Martin Spin Dimpler

ST and R-301-T in from 2-5 seconds per dimple.

The tool can be used for dimpling both aluminum and magnesium alloys, Tycol-655 lubricant being applied when dimpling aluminum but omitted when dimpling magnesium.

The spin dimpler consists primarily of four parts: (1) a female die, similar to that which is used with a pressure pad dimpler, into which the metal is spun; (2) a male spinning tool; (3) a trimmer cutting edge to remove any metal which is extruded upward dur-

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at the DIAMOND

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Carefully*



Diamond tipped cutting tools may be poor, good or excellent — depending entirely on the quality of the diamond used. And usually the price determines what the quality is.

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February, 1947

MODERN MACHINE SHOP 219

ing the forming of the dimple and (4) a pressure pad assembly for holding the workpiece in place during the dimpling operation. To permit easy replacement, the spinning tool is threaded so that it may be screwed into the pressure pad assembly shaft.

The spin dimpler is adaptable to any drill press capable of a speed of 1,500 R.P.M., and can easily be operated by the unskilled or semi-skilled worker. Exact centering of the dimple is assured by an extension tip on the spinning tool which fits the inside diameter of the rivet hole.

Dimples formed by the spin dimpler are characterized by a sharp edge similar to that left by a countersinking tool, thus leaving no void around the rivet head as in the case of the ordinary pressed dimple. Despite the fact that the cladding of the sheet is partially removed by the trimming edge of the tool, comprehensive laboratory tests have demonstrated that the spun

dimple resists corrosion as well as a countersunk hole.

The spin dimpler has been used at The Glenn L. Martin Company to form 10 deg. dimples for 3/32, 1/8, 5/32 and 3/16 inch diameter rivets in both aluminum and magnesium alloys varying from 0.020 to 0.064 in thickness.

Dust Collector for Belt Sander

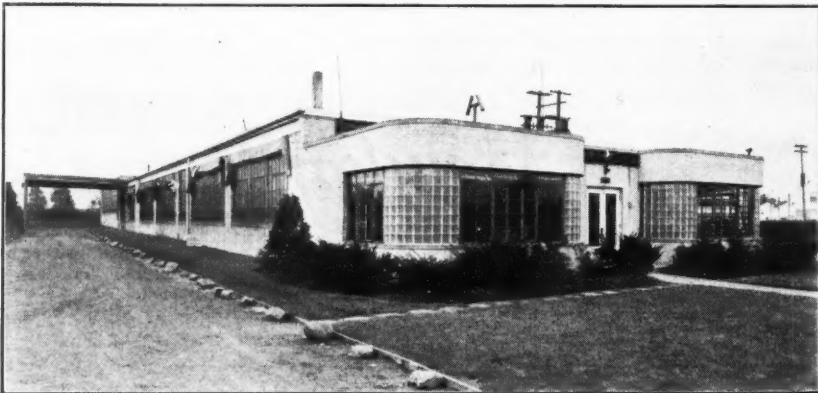
By R. KUMOR

Westinghouse Electric Corporation,
East Springfield, Mass.

THE illustration shows two belt sanding machines equipped with dust guards of a new type that was devised at the Westinghouse East Springfield plant recently in order that the dust might more effectively be collected from these sanders.

Attached to the guard around the sanding head is a short section of cyl-

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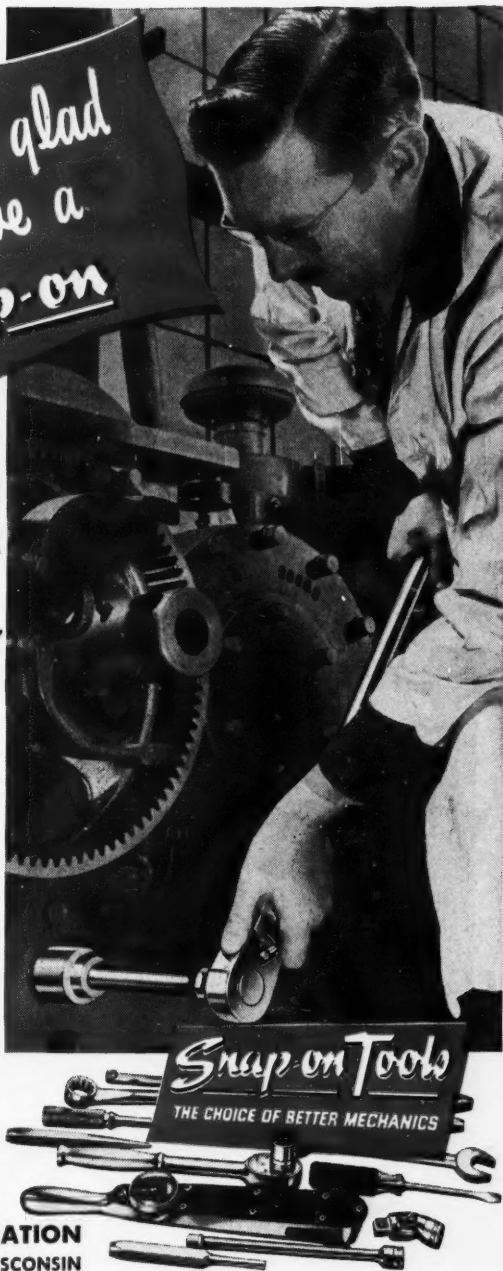
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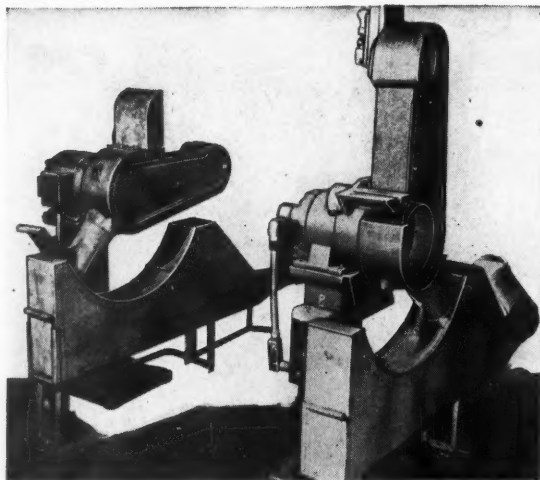
For fast assembly and maintenance work, where large bolts must be tightened in hard-to-reach places, Snap-on Socket Wrenches combine speed and safety with powerful leverage to turn the biggest, tightest nuts.

Snap-on combinations, like the one illustrated above, are highly versatile tools and can be used on dozens of tough nut-turning operations throughout the plant.

Actual working performance has proved their value in stepping-up production . . . and on difficult operations, they are almost indispensable. Without doubt, they are the choice of better mechanics, everywhere. Send for catalog showing complete line of Snap-on tools for production and maintenance.

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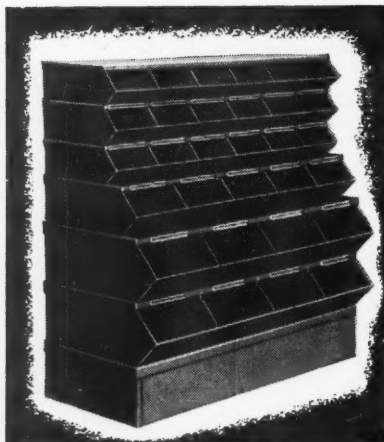


Belt Sanders equipped with Dust Guards that are Equally Effective in the Horizontal or Vertical Position

indrical duct which swings through a 90-degree arc with the guard when the frame carrying the belt pulleys is swung from the horizontal to the ver-

of air into the dust suction system.

The photograph shows one of the machines with the belt in the horizontal position, and the other vertical.



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y, 1947

THE CLEVELAND PUNCH & SHEAR WORKS COY. CLEVELAND, OHIO, U. S. A.

PUNCHES

Fig.	Diameter	Fig.	Fig. 29
2	1/2" by 2 1/2"	11	1/2"
3	3/4" by 2 1/2"	12	3/4"
4	1" by 2 1/2"	13	1"
5	1 1/4" by 2 1/2"	14	1 1/4"
6	1 1/2" by 2 1/2"	15	1 1/2"
7	1 3/4" by 2 1/2"	16	1 3/4"
8	2" by 2 1/2"	17	2"
9	2 1/4" by 2 1/2"	18	2 1/4"
10	2 1/2" by 2 1/2"	19	2 1/2"
		20	2 3/4"
		21	3"
		22	3 1/4"
		23	3 1/2"
		24	3 3/4"
		25	4"
		26	4 1/4"
		27	4 1/2"
		28	4 3/4"
		29	5"

Page 128

and as this is but one of our twenty-one standards you can imagine the enormous quantity of Punches carried in stock to meet immediate demands. Besides, for each standard Punch there is a standard Die, consequently our stock of Dies is as varied as our stock of Punches.

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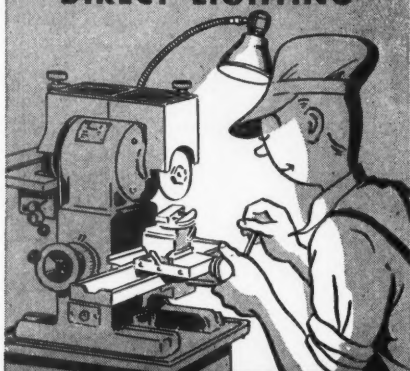
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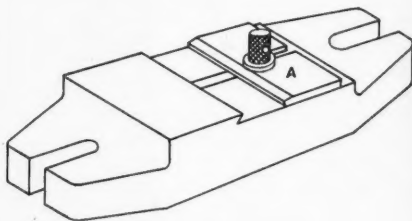
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Fixture to Hold Thin Parts for Drilling

By PETER L. BUDWITZ

THE accompanying drawing illustrates the design of a fixture that was built in our own tool shop to facilitate the drilling of holes in small sheet metal or other thin parts of various shapes and sizes. The fixture operates upon the principle of a vise, having a fixed and a moveable jaw.



Drawing of Fixture for Holding Thin Parts
for Drilling

The base of the fixture presents no problem inasmuch as it is made from a die holder of the standard commercial variety. A locating surface is milled about $\frac{1}{8}$ inch deep and approximately two-thirds of the length of the top surface of the die holder, leaving a shoulder which serves as the fixed jaw. The shoulder is undercut at an angle of 15 degrees to aid in holding down the workpiece while clamping.

The moveable jaw, A, is made from a piece of flat tool steel and heat treated to approximately Rockwell 45-48 C. The holding edge of the moveable jaw is also undercut to increase the clamping efficiency of the jaw and to aid in holding thin work down against the clamping surface.

The moveable jaw is locked in position by means of a knurled head lock screw that is threaded into a tapped hole in the base, as shown. An elongated slot in the moveable jaw permits

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Save machine time, reduce operator fatigue, eliminate special mandrels. Ideal for all turning and grinding operations. Sizes to handle from $\frac{3}{8}$ " hole to $3\frac{1}{4}$ " hole.



Production turning 45° on 11 lb. casting held on M40 Expanding Mandrel.



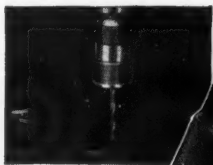
Turning small piece in tool room. L. D. 15 J. held on M40 Expanding Mandrel.



Production grinding 45° on 11 lb. casting. 501 assembly. Using M40 Expanding Mandrel.

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adjustment. An opening is made in the center of the base to provide clearance for drill chips.

In operation, the workpiece is positioned in the fixture with the point at which the hole is to be drilled approximately over the opening in the base. The moveable jaw is then forced into tight contact with the piece and locked in position. The clamping operation is simple and quick, the piece is held without distortion, and the danger of injury to the operator is eliminated.

"Buffalo" Industrial Exhausters for material and air handling are fully illustrated and described in a 32-page bulletin published by the Buffalo Forge Co., P. O. Box 985, Buffalo 5, N. Y. Ratings for all of the wide variety of models in which the exhausters are available are published in full. Dimensional drawings are also included in the bulletin, copy of which is available free to mechanical executives requesting Bulletin No. 3576.

Scherr 1947 Tool Catalog. Publication of a 96-page 1947 tool catalog is announced by the George Scherr Co., Inc., 198-A Lafayette St., New York 12, N. Y. The contents are divided into sections as follows: laboratory instruments such as metallurgical equipment, gas and electric furnaces, and microscopes; machine tools such as toolroom, vertical and horizontal milling machines, a combination shaper and slotter, precision bench lathes, and other types of machines; machinists' tools such as micrometers, stainless steel vernier calipers, sine bars, and so on; measuring instruments such as comparators, both mechanical and optical, new gage and angle blocks, gear testers, height gages up to 48 inches in size, and many other new measuring tools; optical equipment such as toolmakers' and binocular microscopes; and toolroom specialties such as magnetic chucks, grinding attachments, and magnetic holding devices. In addition, the catalog includes a section on transmission equipment and gears, couplings, chains, speed reducers, variable speed drives, V-belts, and sheaves.

Copy of the catalog is available free of charge to mechanical executives addressing requests on their company letterheads.

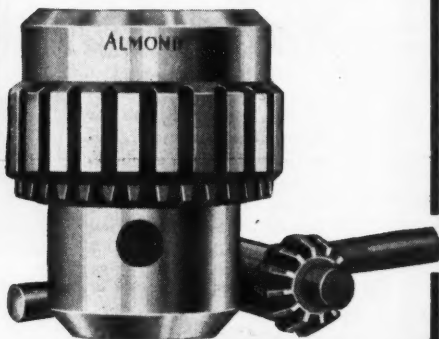


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To hold 1600° F. in the MH-3 furnace requires less than 2 kw. At power rate of 2c per kw.-hr., operating cost is under 4c per hour. Cooley furnaces are easily installed, quiet in operation, and create no fumes or odors.

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THREE SIZES—MH-3, MH-4—1850° F. MH-5—2000° F.

Type	Chamber Capacity	Amps 115 V	Watts	Amps 230 V	Price
MH-3	8"W 6"H 14"L	29.6	3400	14.8	\$146.00*
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MH-5	8"W 6"H 14"L	4800	20.9	\$340.00*

*All furnaces complete with Hearth Plate.

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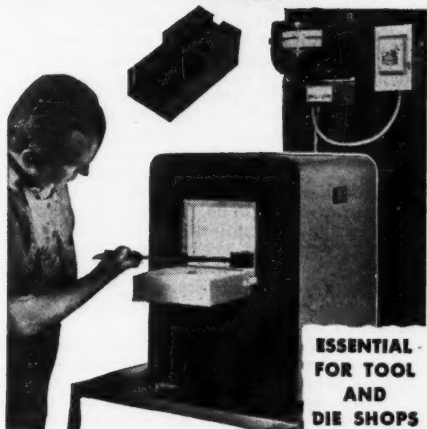
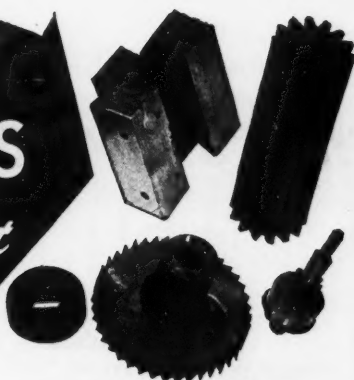


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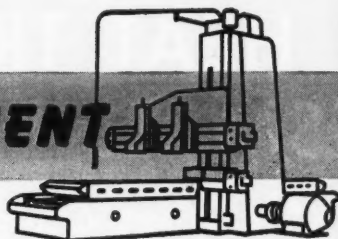
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NEW SHOP EQUIPMENT



"Air-Tracer" Mechanism for Monarch Lathes

Known as the "Air-Tracer," a mechanism which combines an air-tracing device with a hydraulically operated power circuit to produce workpieces with contours which match those of a master template within a limit of tenths is now being offered for use with any of its new type 14, 16, 18, or 20-inch toolmaker or engine lathes by The Monarch Machine Tool Co., Sidney, Ohio. The mechanism may be used for any increasing contour or multiple diameter work. Mandrels, punches, dies, spinning chucks, valves, metering pins, nozzles, impellers, molds and step shafts are typical examples of the kind of work for which it is said to be ideal. Diameters, tapers, square shoulders, necks, and radii on a step shaft may be turned in a single cut.

Since the Air-Tracer provides for accurate sizing automatically, the need for making several setups and taking numerous and repetitive measurements is claimed to be eliminated. An added advan-

tage when step shafts are being turned is the reduction of grinding stock because of the close tolerances which can be consistently maintained. Thin metal templates may be used since the pressure of the tracer against the template is only a few ounces. When certain types of straight shaft work are being turned, a master workpiece, held between centers attached to the template support, may be used.

The operation of the Air-Tracer is described as relatively simple. As shown in Fig. 1, the template is scanned by a spring-loaded air-tracing device working on the air gaging principle. Air from a constant pressure source is supplied to the system through an orifice of such size as to maintain a proper air loading pressure of 35 p.s.i. with the air tracer in its balanced position. The design of the air tracer valve is such that a small amount of air is continually escaping to the atmosphere. As a consequence, a film of flowing air keeps the pressure in constant balance with no appreciable friction or pressure reaction.

Air loading pressure established by the air tracer controls the operation of the tool slide through the hydraulic relay valve. With the air tracer valve in complete balance, the tracer operates with approximately five ounces of pressure

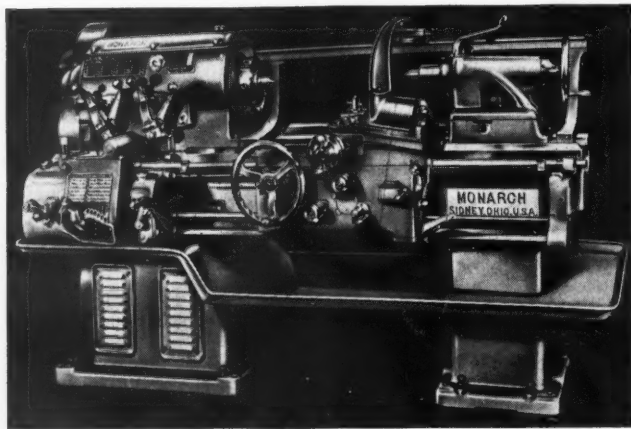
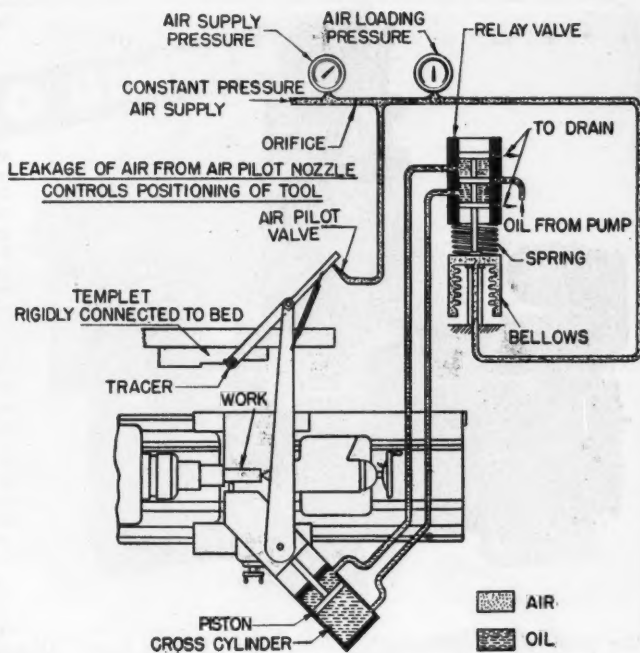


Fig. 1 — Illustration showing the "Air-Tracer" mechanism applied to Monarch Model C engine lathe

Fig. 2 — Illustration showing the function of the "Air - Tracer" mechanism



against the template. While the tracer is scanning a straight section of a template, the balance of the air loading pressure is not disturbed, and the toolslide is locked in position by an equal amount of pressure on both sides of its actuating piston.

The slightest change in template shape increases or decreases the air loading pressure by changing the rate of flow from the air tracer valve. Instantly, the amount of tracer movement from its balanced position is amplified into hydraulic relay valve motion in a ratio of 1 to 100. Air loading pressure is again restored to balance as the toolside moves in the direction and to the extent of the template variation.

Actuation of the hydraulic relay valve is through the medium of a flexible metal bellows. The bellows breathes during air pressure variation, causing it to continuously balance in a position determined by the air loading pressure. Since the hydraulic relay valve stem is attached to the free end of the bellows, movement of the valve is likewise such as to correspond to the air loading pressure.

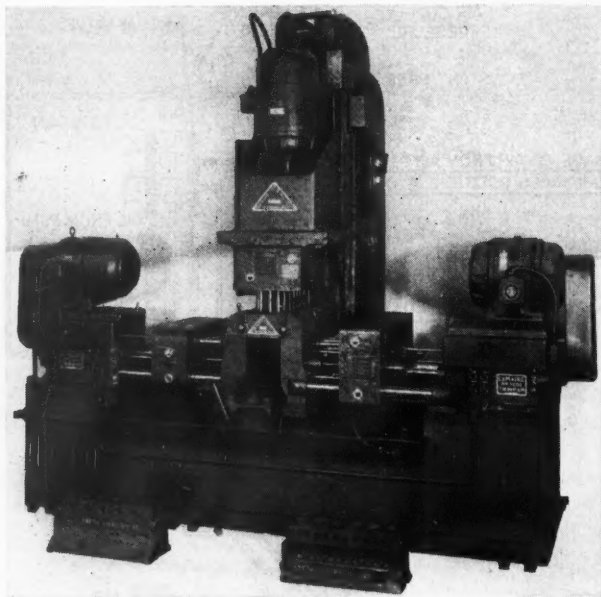
The lathe carriage is moved by the usual power or handwheel feed. Since the toolslide is set at a 45-deg. angle, the tool follows a path relative to the work, which is the resultant of the movement of the carriage and the hydraulically operated toolside. The position of the template support is adjustable along the rail. A micrometer adjusting screw is provided to permit critical longitudinal adjustment of the template. The swiveling base of the template support allows initial setting of the template for par-

allelism with the lathe centers to be accomplished easily by using the air tracer to check the accuracy of the final setting.

LeMaire Special Three-Way Cylinder Block Drilling Machine

A special three-way drilling machine for drilling the top and both sides of an automobile motor block has been developed by the LeMaire Tool & Mfg. Co., 2657 S. Telegraph Rd., Dearborn, Mich. The machine consists of a one-piece rigidly fabricated base on which LeMaire No. 5000 twin ram units with multiple spindle heads are mounted at each end and a LeMaire No. 20 slide type hydraulic drilling machine less table and base is mounted at the rear. The work-holding fixture provided is of the tunnel type incorporating all drill bushings.

To drill, the part is first slid into the fixture on wear strips guided by the crank bore to an approximate stop. Manually operating retractable pins are then engaged with the locating holes and



LeMaire Special Three-Way Cylinder Block Drilling Machine

Way Drilling Machine include a conveniently located cycle operating control box having plainly marked buttons for cycle start, and emergency return. The work-holding fixture is designed to readily discharge all chips, and extra large chip troughs are provided in the base of the machine. All important fixture locators subject to wear are readily replaceable. Helical drill heads and standard hydraulic drill gears are used in all units.

the part is held over both sides of the top by hand-operated cam-locking toe clamps. The machining cycle is as follows: (1) 19 holes are drilled in the right side of the block; (2) 34 holes are drilled in the top; (3) 5 holes are drilled and counterbored; (4) 2 holes are drilled and spotfaced; and (5) 3 holes are drilled in the left side of the block. The production rate is said to be approximately 60 pieces per hour at 100 per cent efficiency, allowing 30 seconds for loading and unloading work.

Features of the LeMaire Special Three-

"Red Ring" Diagonal Gear Shaver Machine

Incorporating a unique method of feeding the work gear across the cutter, the "Red Ring" Diagonal Gear Shaving Machine illustrated herewith has been brought out by the National Broach & Machine Co., 5600 St. Jean, Detroit 13, Mich. In the machine, the work is fed at an angle to its axis, the angle being selected with reference to the dimensional and physical characteristics of the gear being shaved. The angle is also se-



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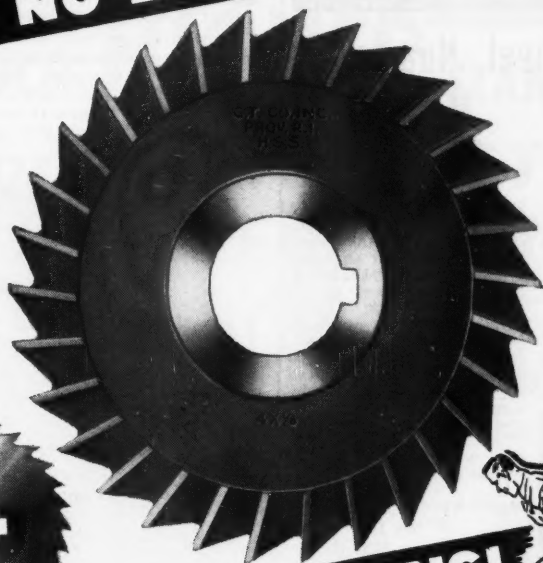
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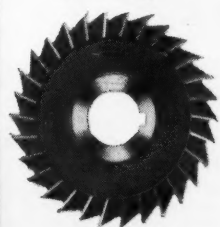


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Here are two types of slitting saws for regular and heavy feed duty. The Circle R side chip slitting saw in particular is designed to take deep cuts, split chips and eliminate dragging. With all Circle R saws, in all sizes, there is no binding, no dragging.

For complete details and specifications on these and other Circular Saws, send for our Catalog L.

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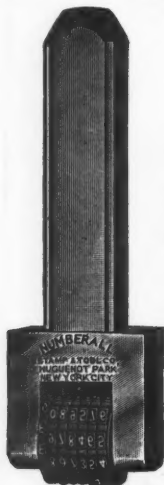
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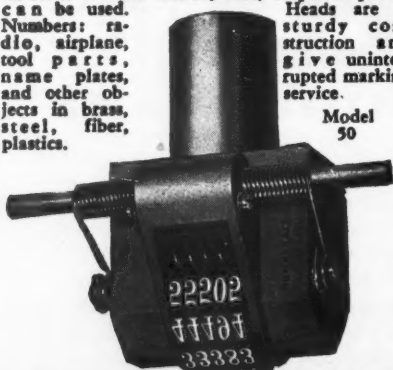
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Automatic indenting numbering head for consecutive or repeat numbering. 1/32" up to 3/8" high figures can be furnished in sharp face Gothic or shaded Roman figures. Prefix or suffix letter wheels. Bench, foot, or power presses can be used.

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Heads are of sturdy construction and give uninterrupted marking service.

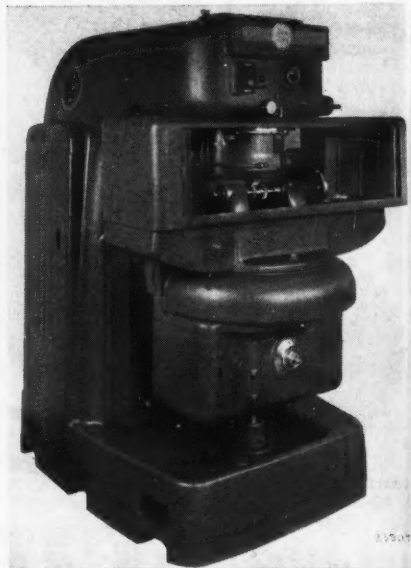
Model
50



NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

lected which will facilitate optimum conditions for both cutting speed and surface finish.

According to the manufacturer, traversing the work diagonally under and through the cutter accomplishes several significant results, especially desirable where a large volume of gears having the same characteristics are to be shaved. The diagonal traverse facilitates the shearing action at each cutting edge, thus making it practicable to remove a maximum of stock per cycle in a mini-



"Red Ring" Diagonal Gear Shaving Machine

mum of time. The entire cutting cycle consists of two passes of the work through the cutter.

An additional advantage claimed for diagonal traverse is that the full face of the cutter is effective during each cutting cycle, thus materially extending cutter life. With diagonal traverse, there is said to be no restriction on the face width of the cutter, consequently, the cutter face width may be considerably less than the face width of the work gear and no special cutters are required. Further advantages of diagonal feed are described as positive control of lead on helical gears, minimum danger of cutter breakage when processing shoulder

A MUCH **HIGHER** STANDARD OF METAL CUTTING PERFORMANCE

Watch your production drive ahead when you install SAWMORE METAL CUTTING MACHINES. Extremely fast—highly accurate—rugged—modern in design—SAWMORE sets

higher precision metal cutting standards with an economy of operation that slashes labor costs and builds profits.

These are the highlight features of SAWMORE machines: ★ Four Cutting Speeds—65, 93, 120, 149 strokes per minute. ★ Self-aligning blades give absolute cutting accuracy. ★ Stock is fed automatically to full capacity of machine. ★ Machines swivel on base up to 45° permitting angular cutting without moving stock. ★ Gears are in constant mesh, reducing amount of backlash to minimum. ★ Positive compensating feed cuts more metal in less time. ★ Transmission housed in oil tight case.

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MAQUOKETA, IOWA

gears, and minimum difficulty with tapered tooth conditions on such gears. The center distance between cutter and work gear is said to remain constant throughout the complete run of any size of work gear. This constant center distance and constant backlash at the loading position afford the operator an immediate automatic check by which he can screen out oversize gears. With the center distance constant and the rate of table feed set, the operator is unable to jeopardize the shaving cutter and tooth surface smoothness of excessive rates of feed. Loading and unloading time can

be further reduced by the addition of a new type quick-loading tailstock.

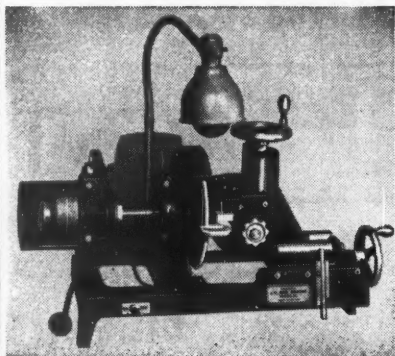
If crowning is desired, the crown is ground into the cutting tool and, by varying the diagonal angle of feed, the amount of crown on any individual gear or group of gears may be varied to any desired amount of the maximum crown in the cutter.

Bryant Series No. 212 Automatic Internal Grinder

The Series No. 212 Automatic Internal Grinder announced by the Bryant Chucking Grinder Co., Springfield, Vt., is designed to fill the need for a precision high production automatic internal grinder requiring minimum operator attention. It is so designed that where required, one or more machines can be operated by the same operator.

Maximum rigidity is provided in the design of the machine by a cylindrical slide construction. The slide bar to which the wheelslide is attached is supported on two bearings in the base of the machine. A shoe beneath the rear of the wheelslide follows a hardened and ground control plate. The wheelslide is thus supported at three points, each of which is provided with pressure feed lubrication.

The machine has a 9-inch swing inside the standard water guard and a 12-inch total wheelslide traverse. The cross feed is obtained by lateral motion of the workhead which is supported by specially designed anti-friction bearings of the roller type. The machine is suited for grinding work with bores from $\frac{1}{8}$ inch in diameter up to $3\frac{1}{2}$ inches in diameter, and the grinding traverse permits the grinding of 3-inch bore lengths. For the smaller ranges of bores, Bryant Hi-Frequency wheel spindles operating up to 100,000 r.p.m. may be used. A variety of



Patent Applied For

Sharpen Dull Pipe Wrenches

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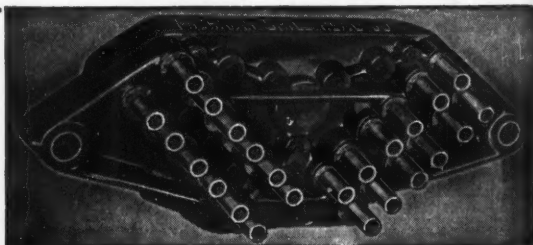
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Pictured: a 24-Spindle Heavy-Duty Drill Head.

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OF MULTIPLE DRILL-
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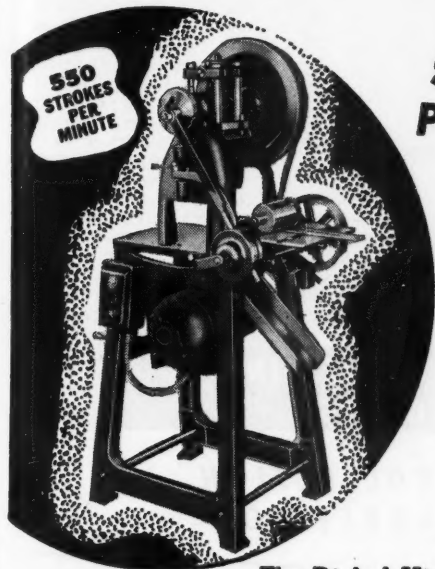


MICHIGAN DRILL HEAD CO.

971 E. 8-Mile Road, Hazel Park, Mich.

DIEBEL

Hi-Speed ⁵⁵⁰_{R.P.M.} AUTOMATIC PRESS



**STEPS UP
PRODUCTION
CUTS COSTS**
on all Small Stampings
**METAL
PLASTIC
FIBRE
PAPER
RUBBER
LEATHER**



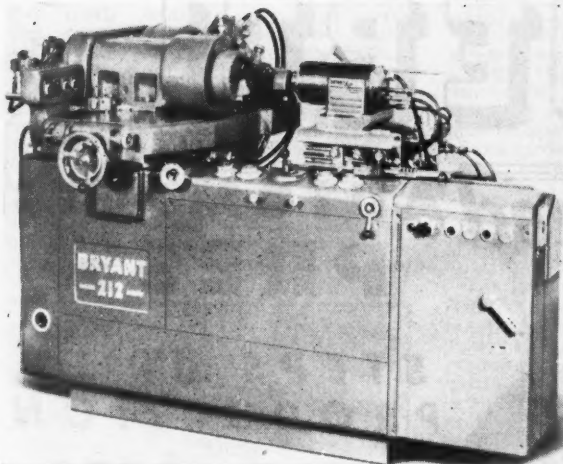
The Diebel Hi-Speed Punch Press requires less floor space—less power—increases production—is safer—releases heavier presses for other production.

Remember—this versatile Hi-Speed Automatic Press is adjustable up to 550 strokes per minute!

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Bryant Series No. 212 Automatic Internal Grinder

ous units. Cycle control is accomplished electrically so that the cycle can be readily changed to suit varying working requirements.

Three methods of automatic sizing can be provided for the machine. The basic machine is equipped so that change-over from one method to either of the others can be accomplished merely by the addition of the sizing equipment.

Sizing from the truing diamond is effected by predetermined advance of the wheel beyond the wheel truing position, which is performed between the rough and finish grinding positions of the cycle. Wheel wear is automatically compensated for by the machine.

standard or special tooling may be used in conjunction with the machine to meet the particular needs of the customer.

The various movements of the machine are hydraulically actuated to afford flexibility of operation between the vari-

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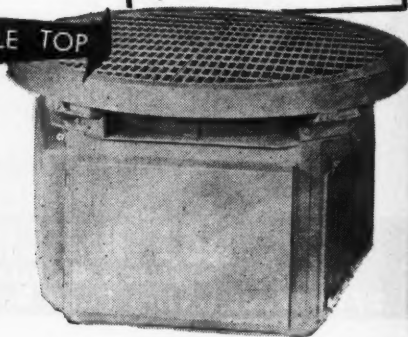
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- Helps operator work comfortably in dust-free air
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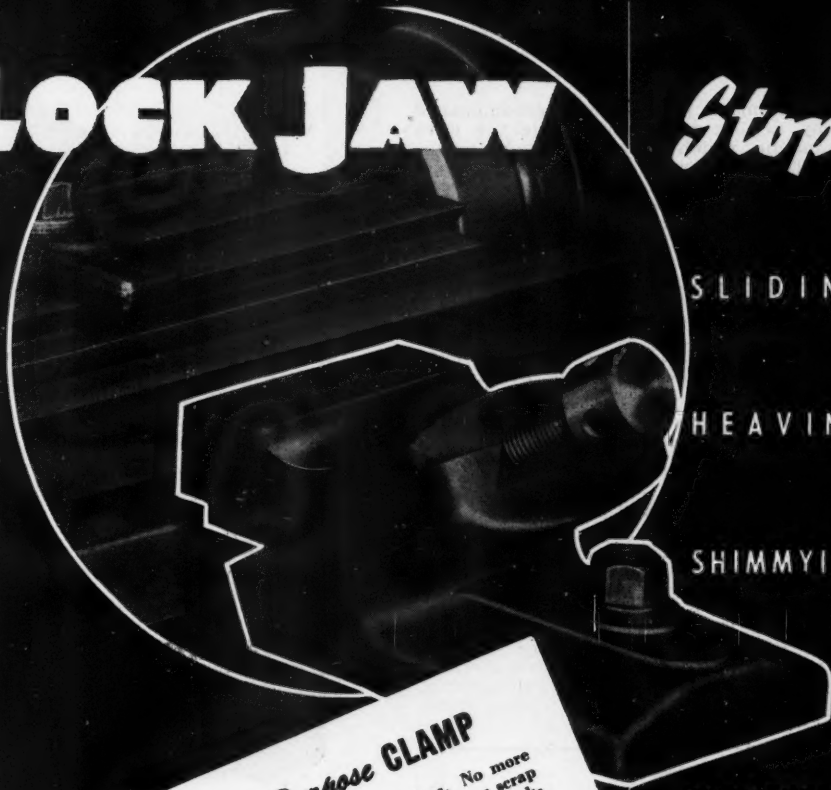
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Speed up production, improve quality and eliminate health hazards with this revolutionary dust collecting bench.

TURNTABLE TOP



LOCK JAW



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HEAVING

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HANDY New All-Purpose CLAMP

Eliminates expensive clamping and bolting operations. No more hunting around the shop for straps, bolts, washers, nuts or scrap pieces to wedge or lock your work in position. No oddly and awkwardly contrived, odd-sized and makeshift locks, limited in their ability to wedge and hold.

Now LOCKJAW gives you positive, powerful two-way locking, sure grip pressure downwards and side-ways. It may be set at any angle on the table and held by the T-slot bolt. Then LOCKJAW pressure is applied to one or more pieces of stock by simply adjusting Capstan Jack Screw.

Setting up or taking down is a quick and simple operation. Every machine shop, tool room, or metal working unit can find many handy uses for this new Rivett conceived clamp on their planers, radial drills, shapers, milling machines, surface grinders and boring mills.

You, too, will save time, trouble and inconvenience when you use LOCKJAW to eliminate cumbersome and awkward clamping.

RIVETT

RIVETT LATHE & GRINDER, Inc.

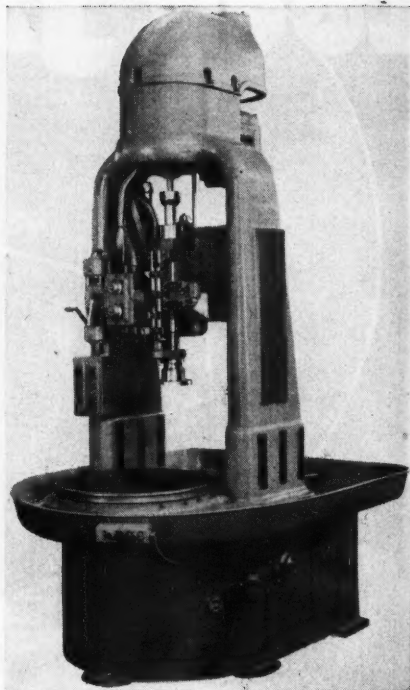
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Automatic plug sizing is accomplished by a plug gage, mounted in the work spindle, which automatically checks the bore size after each pass of the grinding wheel. As the plug gage enters the bore, the machine automatically ceases grinding, and the wheel withdraws from the bore ready for loading of the next workpiece.

A third method of sizing can be applied wherein a diamond-tipped finger, contacting the bore as it is being ground, operates electrical contacts at the proper time to arrest the grinding action of the machine, withdrawing the wheel from the bore, ready for the insertion of the next workpiece.

Edlund "Drill-O-Matic"

Known as the "Drill-O-Matic," a tool for high production indexed machining operations with single tools for multiple spindles on an automatic or semi-automatic basis has been brought out by the Edlund Machinery Co., Inc., Cortland, N. Y. The machine is designed to automatically perform intricate and precision drilling, countersinking, counterboring, spot-facing, reaming, and tapping opera-



Edlund "Drill-O-Matic"

**CARROLL
AND
JAMIESON
LATHES
15" AND 16"**

**12 Speed Geared
Head Motor Drive
Timken Mounted
Spindle.**

**Modern Design—
Liberal
Dimensions.**

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**THE CARROLL & JAMIESON
MACHINE TOOL CO.**

tions over a wide range of workpieces with a minimum of tooling.

Features of the spindle operation include rapid approach, variable feed over a wide range, optional dwell and selected timing, and rapid return. The feed and speed of the spindle may be changed by simple visible controls. The spindle is driven by a constant-speed foot-mounted ball-bearing motor through a variable speed V-belt. Spindle speeds are variable through a ratio of 5.5 to 1 without back gears or 22 to 1 with back gears.

The spindle is mounted vertically and centrally between the uprights of the A-shaped frame, thereby providing maximum rigidity and eliminating distortion due to end thrust, it is claimed. The hydraulic spindle speed mechanism is so constructed that all thrust is created along the vertical axis. The feed controls provide for infinite variation between 0 and 18 inches per minute.

The spindle sleeve is fitted with a flanged quill for supporting a multiple

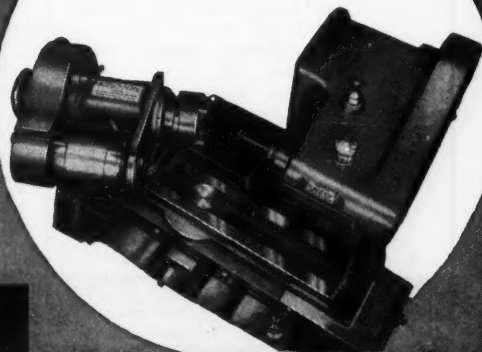
GRENBY HYDRAULIC GRINDING MACHINES

FEATURES

- Infinitely Variable Longitudinal Traverse
- Hydraulic Cross Feed
- Coolant
- Precision Spindles
- Heads Swivel For Angle Work
- Grinding Heads To Convert For Internal Grinding (See Cut)

EG103 SPECIFICATIONS

Work Capacity—3" Dia. x 10" Length
 Workhead Accommodates—Collets 1" Max. Hole
 —Chucks & Face Plates 4" Max.
 Clear Space & Wt. 45" Long x 25" Wide—1600 lbs.



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**COSTS A LITTLE MORE
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Model
"400"

- ✓ Life-time machine tool construction.
- ✓ Horizontal or vertical — only a minute to change.
- ✓ Uses 4" x 35" or 36" abrasive belts — 1/2 HP motor.
- ✓ Ball-bearing — sealed-for-life ball bearings.
- ✓ Heavy cast iron construction — Net weight 80 lbs. Gross weight 115 lbs.
- ✓ Dry machine shown — wet available.
- ✓ Built by America's leading producer of Grinding and Polishing (including Automatic) Machinery.
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drill head containing any number of spindles desired within the capacity of the machine. In cases where two or more sizes of tools are used, the speed of the cutter spindle may be varied to provide the proper speed for each tool. Raising or lowering of the spindle may be quickly effected by a screw and nut adjustment. To allow for the handling of unusually high workpieces, the A-frame of the machine can be extended by inserting standard spacers.

The automatic indexing table is 28 inches in diameter and can be made with any practicable number of indexes. The operating cycles of the spindle and indexing table are controlled throughout by Vickers hydraulic equipment, and may be automatic or semi-automatic. The motor, pump, relief valves, and tank of the hydraulic system are located in the base where the mechanism and piping are readily accessible.

The indexing of the table is controlled by a limit switch that can only be actuated by the complete return of the spindle. The downward movement of the spindle is controlled by a limit switch that can operate only upon the seating of the table locking pin. This dual safeguard is said to positively ensure correct timing between the spindle and the indexing table.

The outside of the machine frame is machined to allow for the mounting of a tapping head, independently driven and controlled by a lead screw. The operation of the tapping head is synchronized with the table index. Adjacent to the indexing table, space is provided for mounting guide pin brackets for accurately locating multiple heads and a drill bushing bracket for accurately controlling the position of the drills.

Kaukauna Series 125 Portable Universal Horizontal Drill- ing and Tapping Machine

Designated as the Series 125, a universal horizontal drilling and tapping machine which is readily portable has been brought out by the Kaukauna Machine Corp., Kaukauna, Wis. An outstanding feature of the machine is the head which can be swiveled 360 deg. in either a horizontal or vertical plane, thus enabling the spindle, which has a 12-inch continuous travel, to be operated at any desired angle.

The headstock is positioned on two individually controlled axes to permit the head to swivel 360 deg. on a trunnion and

SHELDON

New

**TRB-S56
Precision
Lathe
\$1000.00**



MORE ACCURACY, MOST LATHE PER \$

No other moderate priced lathe and but a few of the most expensive, have the "Zero Precision" tapered roller spindle bearings, have beds and ways on lead screws held to such close tolerances. In standard quality tool features, no other lathe can offer as much capacity, utility, and convenience per dollar, as you get in the new Sheldon TRB-S56.

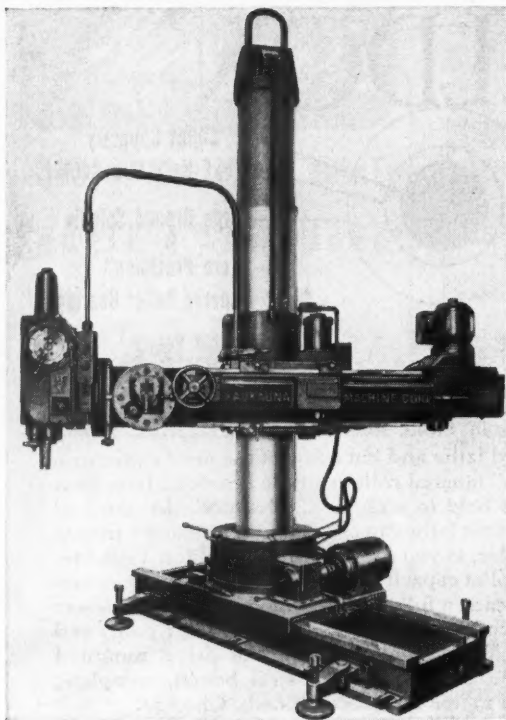
This 11 1/4" swing, 1" collet capacity, 56" bed precision lathe comes with full quick change gears, a full double walled apron with power longitudinal and cross feeds, 8 spindle speeds (35-1350 r.p.m.) and a fully enclosed double V-Belt underneath motor drive, mounted on a modern welded steel bench, complete, less motor for \$1000.00 f.o.b. Chicago.

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SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers
4258 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.





Kaukauna Series 125 Portable Universal Horizontal Drilling and Tapping Machine

machining operations. The rail may also be swiveled through 360 deg. to perform machining operations at any point around the machine.

The work is held on an indexing table which enables it to be quickly rotated to present five surfaces to the machine. The spindle speed unit is located at the opposite ends of the rails and encloses the speed gearing controlling the spindle speeds. Three spindle feeds are provided, and the drive to the spindle consists of a 9-speed gear change box, with a direct drive to the spindle through the necessary gears and drive shaft. The nine speed changes are obtained by dual rotary selector levers, with an indicating dial showing at all times the spindle speed engaged. The levers are located near the head where they are within easy reach of the operator regardless of the head position.

A total spindle movement of 36 inches radially from the center of the column is available since the head is mounted on two horizontal rails having a 24-inch horizontal adjustment and the spindle has a 12-inch continuous travel. To facilitate machining operations on long workpieces, the column is supported on a traveling base having a 48-inch power travel.

Dual controls afford the operator easy

the trunnion to swivel 180 deg. The two rails supporting the head and trunnion have a 24-inch horizontal traverse, and their movement is effected through the use of dual handwheels, with dual hand clamps provided for locking the rails in position. In addition, the rail may be raised or lowered by power and positioned at any point suitable for performing the

SAVE TIME with SOMERSET RADIUS DRESSER

The Somerset Radius Dresser, widely used in shops throughout the country, presents many outstanding features. Wheel is dressed from below, avoiding removal of guard. Stop pins permit rotation thru 180° or 90° in either direction. New Weavever bearing is dust proof. Many other advantages.

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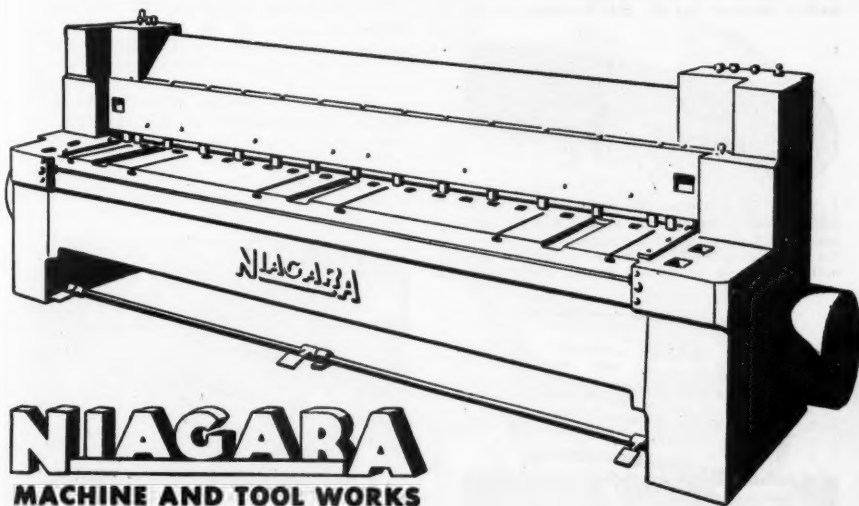
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America has been built by the creative genius of men who have contributed new ideas, new products, new improvements which make the world a better, brighter and happier place in which to live. The genius of Thomas Alva Edison gave us electric lights, motion pictures, phonographs and a host of other inventions which have built industries which have helped build America.

As builders of presses, shears and machines for sheet metal working, the men of Niagara appreciate their opportunity to help American people enjoy the better things of life,—thanks to the ability of Niagara machines to multiply the productive efficiency of men who use them.



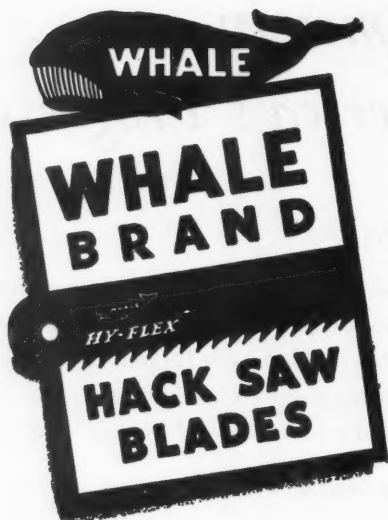
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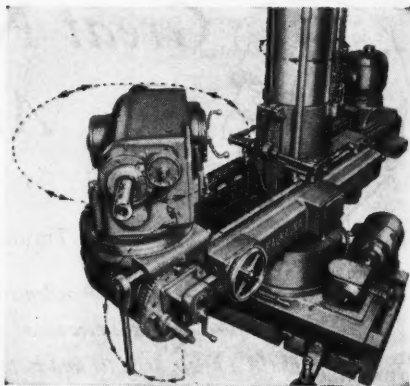
Every Forsberg Blade bears the famous WHALE BRAND mark of quality. Scientific heat treating and thorough check every step of the way, plus a severe bending pounds test gives Forsberg Blades superior performance. The popular HY-FLEX Blade meets today's demand for extreme flexibility at medium price—it has the guts for solid service.



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Forsberg
MFG. CO., BRIDGEPORT, CONN., U.S.A.

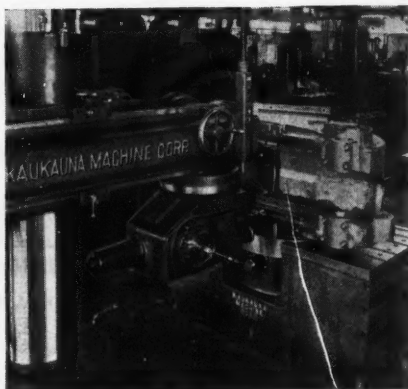


The head swivels 360 deg. in either a horizontal or vertical plane.

and complete control of the machine regardless of the head position. Electrical collector rings on the base of the column are said to prevent cable interference regardless of how many times the machine is revolved. A lifting ball attached to the upper end of the column allows for quick and easy handling of the machine.

The Kaukauna Series 125 Drilling and Tapping Machine is available in three models designated as the 125-U, 125-HR, and 125-H. The Model 125-U is a completely universal machine and is designed to drill and tap holes at any conceivable angle. The Models 125-HR and 125-H are horizontal machines, and each has the

Tapping, with the head swung under the rail



L-W

SWIVEL BASE MILLING MACHINE VISES

MASTER \$38.00

Jaws: 6½" wide, 2" deep.
Opens 4" with jaws, 5¼" without.
Wt. complete with crank, boxed, 85 lb.

★
JUNIOR \$28.35

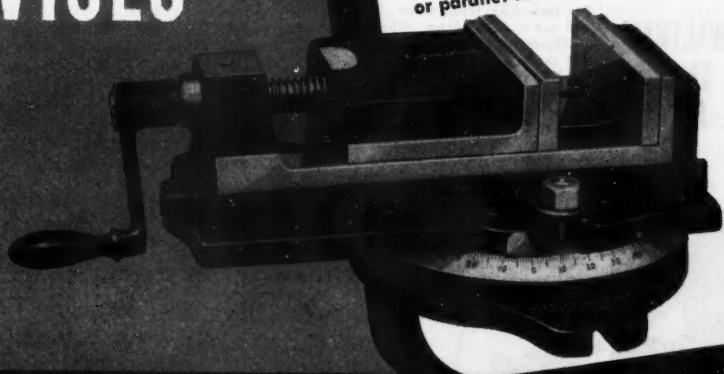
Jaws: 4½" wide, 1¾" deep.
Opens 3" with jaws, 3½" without.
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STEEL JAWS
Suited to drill press and shaper work.

GRADUATED BASE
Can be used plain or swivel.

LARGE ACME STEEL SCREW
Contributes sturdiness and durability.

FOUR BOLT AND KEY SLOTS
are provided for rigidly attaching to
machine table so that work holding
surfaces are at true right angles
or parallel to table.



Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products



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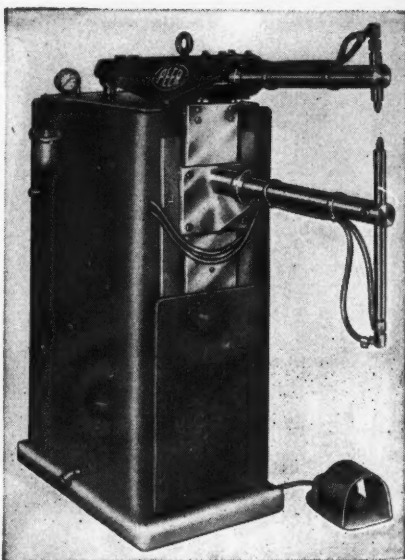
L-W CHUCK COMPANY

28 SO. ST. CLAIR ST.
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head mounted on two horizontal rails having a 24-inch horizontal adjustment. All three models when centered within cylindrical work can be used to drill or tap holes at any angle without changing the position of either the machine or the workpiece, since the spindle is radial to the center of the column of the machine. The Model 125-H has a smaller range of application than the other two models, and its compact design is said to make the unit readily adaptable for lowering into small vessels or for operation in close quarters.

Peer Series A-200 Automatic Air-Operated Spot Welder

Designated as the Peer Series A-200, a high speed, fully automatic air-operated rocker arm spot welder incorporating a double-acting air cylinder of ample size to provide the high electrode pressure essential for the consistent high production of quality welds is announced by the Pier Equipment Mfg. Co., Milton & Cross Sts., Benton Harbor, Mich. The rocker arm is mounted on roller bearings to afford long life under severe operating conditions, and the hammering of the

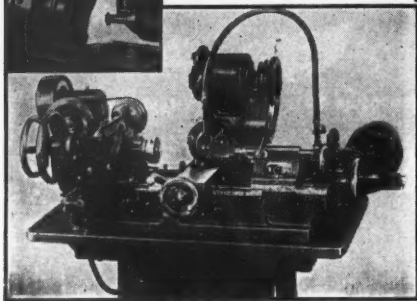


Peer Series A-200 Automatic Air-Operated Spot Welder

WALTHAM Thread Miller

For threading small parts. It will cut V, N.S., Acme, Whitworth and Metric threads, special threads. Special head for internal threading is shown in insert at left. Special head for relieving can also be furnished. Send us drawings or samples and we will gladly submit our suggestions, no obligation. Also makers of Small Milling Cutters, Sub Presses, Pinion and Gear Cutting Machines. Write for illustrated bulletin.

Waltham Machine Works
Waltham • Mass.



electrodes is said to be minimized by the lightweight welded steel construction of the rocker arm assembly. Minimum obstruction on the front of the welder and around the rocker arm assembly facilitates the handling of large or irregularly shaped parts, and a highly efficient electrical design provides a low power demand for a given welding job, it is claimed.

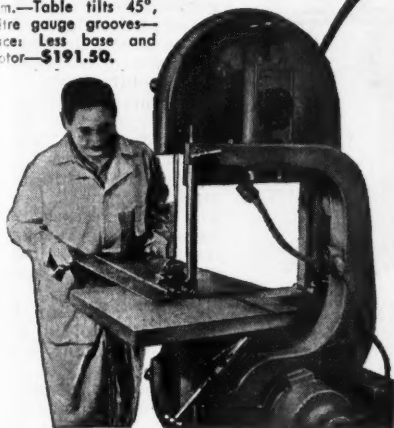
The Peer Series A-200 Welder is available in capacities of 10 and 15 kva and in throat depths of 8, 12, 18, 24 and 30 inches. Standard equipment includes a foot switch control, air pressure regulator, universal horns, water-cooled electrode holders, and one set each of straight and offset copper alloy welding points.

Colonial FS3-36 Flat Broach Sharpener

Designed to enable tool grinders to sharpen flat surface broaches even several feet long while comfortably seated and relaxed, the Colonial FS3-36 Flat Broach Sharpener illustrated herewith

16" METAL CUTTING BAND SAW—MBN1105

Speeds: 70 to 2215 f.p.m.—Table tilts 45°, mitre gauge grooves—Price: Less base and motor—\$191.50.



**RADIAL CUT-OFF MACHINE
MRA 1120 OR MRA 1130**

21½" ram travel—Price: With 2 or 3 h.p. geared motor, less base—\$454.25.



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Each of the Walker-Turner Machines shown on this page has long since "paid in full" its low initial cost in savings due to its increased production over the heavier and less flexible tools which they replaced.

In fact, the investment is so low that it is profitable to employ them as part time workers on jobs that were not completely mechanized before.

Used by the thousands on 24-hour day schedules for volume production during the past ten years, they are now being purchased to tool up for low costs in the competitive markets to come.

Plan your operations to speed up production in many directions with Walker-Turner Machine Tools—and use the guidance of your nearest Walker-Turner Distributor.

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COMPANY, INC.
PLAINFIELD, N.J.
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DRILL PRESSES—HAND AND POWER FEED • RADIAL DRILLS • RADIAL SAWS
METAL CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS



Colonial FS3-36 Flat
Broach Sharpener

has been brought out by the Colonial Broach Co., Box 37, Harper Station, Detroit 13, Mich. To permit the operator to comfortably sit close to the machine, the base is built up out of three pedestals. Two of these support the table at either side, forming a deep knee hole at the back of which is the third pedestal supporting the grinder head. Two handwheels for controlling lengthwise movement of the table and for raising and lowering the

the machine within a "lazy reach" of the operator. Moreover, the control is adjustable up and down, in and out, and radially so that the tool grinder can set it to whatever operating position is most comfortable for him. To further ease the operation, the cross slide carrying the grinder head is of lightweight construction and is mounted on ball bearings at both the top and bottom. With this construction, all sliding friction is said to be

grinder head are located at the right side of the knee hole where the operator can reach them comfortably.

The main operating control on the machine is the "lazy-reach" lever with which the grinding wheel is moved back and forth across the face of the broach teeth to sharpen them. This lever is mounted on the front of

For HIGH-RATIO Levers

Specify

COMPACT DESIGN

HIGH TORQUE

HIGH-RATIO LEVERS

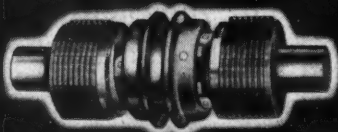
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EASY ADJUSTMENT

ROCKFORD
PULLMORE



MULTIPLE-DISC
CLUTCHES

High-ratio operating levers give PULLMORE clutches powerful engagement with slight axial pressure and short movement of the shifter spool, consequently operation is quick and easy. Decutching is equally fast and positive. The shifter spool has an extra deep slot which is hardened and ground. This prolongs the life of the clutch, reduces wear on the shifter fork and holds run-out to a minimum.

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Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

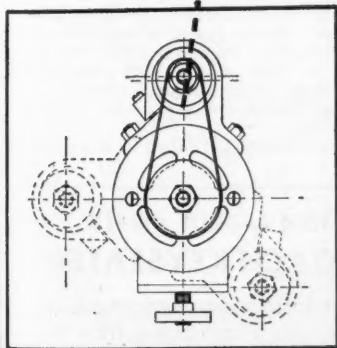
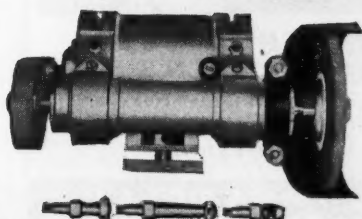
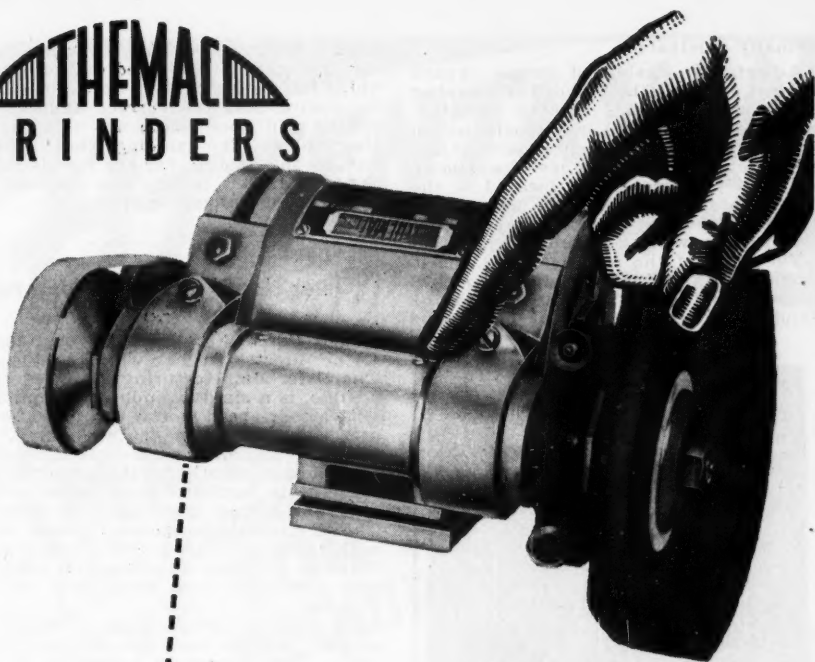


ROCKFORD CLUTCH DIVISION

BORG-
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THEMAC GRINDERS



The dotted line points to the manually operated eccentric tube. This exclusive THEMAC feature provides proper belt tension at all times.

The sketch to the left illustrates the circumferential adjustment of Spindle Assemblies, which is 270 degrees for type J-45.

You can do any type internal or external grinding, on any size lathe, with THEMAC grinder Type J-45. Its interchangeable spindle extensions make this a tool of many uses.

Holes $\frac{1}{4}$ " to $\frac{1}{2}$ " diameter can be ground to a depth of $\frac{3}{4}$ ".

Holes $\frac{3}{8}$ " to $2\frac{1}{2}$ " diameter can be ground to a depth of 2".

Special extensions up to 6" in length can be supplied as extra equipment.

Write for catalog describing other features. Sold through your local mill supply distributor.

THE MCGONEGAL MANUFACTURING CO.

135 MOZART STREET

EAST RUTHERFORD, N. J.

February, 1947

MODERN MACHINE SHOP 249

virtually eliminated.

Adjustable cushioned stops guard against shock at the end of the travel of the cross slide, thus making operation of this slide with the lazy-reach control even easier. Start and stop buttons and a magnetic chuck switch lever (available as extra equipment) are located in the front center of the machine where they are instantaneously accessible and yet do not interfere with the operator's position.

The table of the machine is 48 inches long and has a 36-inch travel. Broaches longer than the length of the table can be handled by extending one end of the

broach beyond the table while sharpening the other. Graduated dials are provided for quickly setting up the machine to ensure that the correct angular indexing and hook angle are obtained in sharpening. The grinding wheel spindle can be operated at various speeds ranging from 4,000 to 10,000 r.p.m. through the use of interchangeable pulleys.

Oster No. 650 Semi-Automatic Lathe

The Oster No. 650 Semi-Automatic Lathe illustrated herewith, product of The Oster Manufacturing Co., Cleveland 3, Ohio, is a single-spindle unit equipped with a four-speed motor, hydraulic feeds, and semi-automatic features, with all controls, including push-button station, located conveniently for the operator. The machine is furnished with either single or double-action cross slides as desired. The hydraulically-operated cross slide with necessary valves and other control features provides an automatic cycle of fast approach, feed, dwell, fast retraction, and stop.

The headstock casting contains the spindle, spindle bearings, and oil reservoir. The spindle is provided with a flange type American Standard 6A1 spindle nose for mounting the collet head or other work-holding devices. The four-speed motor furnished as regular equipment has an operating rating of $7\frac{1}{2}$ h.p. maximum. The motor supplies direct drive for the ball bearing mounted spindle which is equipped with a push-out or draw-back collet operated by a hydraulic cylinder. Motor speed is controlled by a speed selector switch. Starting and stopping of the motor are controlled through the pushbutton station. A thermoguard protects the motor against overload.

The cross slide is actuated by a $3\frac{1}{4}$ -inch



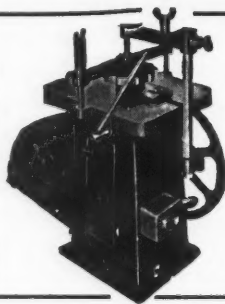
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Single or multiple diameter pieces.
High Quality Work Since 1931.

Prompt Service.

COMMERCIAL CENTERLESS GRINDING CO.

6605 Cedar Ave., Phone: EN 3412, CLEVELAND 3, O.



TO RAISE PRODUCTION — CUT COSTS THE READING BROACH KEYSEATER

The Reading Bench Machine does not require bushings or guides. No other machine like it. Very fast—capacity from $\frac{1}{8}$ to $\frac{3}{8}$ cutter.

Low first cost—prompt delivery.

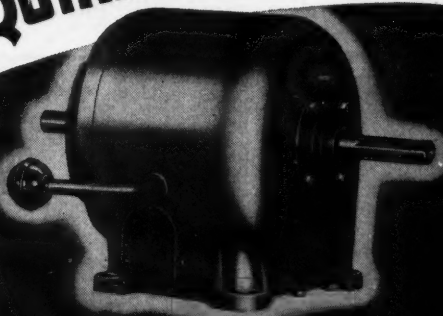
READING MACHINE COMPANY • Reading (Cincinnati), Ohio

ATTENTION!

Manufacturers and Users

**LIMA NOW OFFERS A
Multi-Speed GEAR REDUCTION
DRIVE FOR MACHINERY
REQUIRING UP TO 1hp.**

**ADAPTABLE TO...
MACHINE TOOLS
CONVEYORS
BLOWERS
MIXERS
ROLLS
DRYERS
AND MANY OTHER
MACHINES REQUIRING
... SELECTIVE ...
... SPEEDS**



**TYPE RD ILLUSTRATED DESIGNED
FOR SEPARATE MOTOR DRIVE**
Other Integral LIMA Gearshift Drives
Single phase ½ and ¾ hp.
Polyphase ½ hp to 20 hp.

THE LIMA ELECTRIC MOTOR CO.

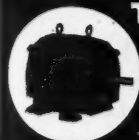
146 FINDLAY ROAD

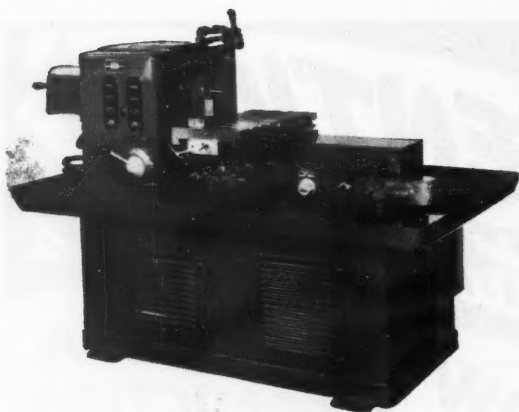
LIMA, OHIO

REPRESENTATION IN MOST PRINCIPAL CITIES

LIMA GEARSHIFT DRIVES

LIMA PEDISTAL GRINDERS - LIMA ELECTRIC MOTORS





solenoid is energized and the cross slide is operated automatically.

The hydraulic pump and its 2 h.p. motor and main relief valve are mounted in the base of the machine, easily accessible through the louver door. The motor is controlled through a magnetic switch actuated by a "start-stop" push button.

The automatic chuck is equipped with a draw-back collet with an adjustable work stop in the spindle. The collet is operated by means of a hydraulic cylinder with a 2-inch bore and 2¼-inch stroke. Collet is controlled by a lever-operated valve mounted on the bed, below the cross slide.

diameter hydraulic cylinder which is controlled through the action of a lever and solenoid operated valve. When desired (chiefly for set-up purposes), the solenoid can be disconnected from the circuit by turning a button to "hand" position, and the cross slide is then operated by hand in both directions. When the button is turned to "automatic," the

A centrifugal coolant pump is driven by a ½ h.p. motor. The push-button station that controls the hydraulic pump motor also controls the coolant pump motor. The motor for the hydraulic pump can be operated independently by



SAVE HANDS WITH STRANDS

**Safeguards
For Punch
Presses**

**Send for Enclosure
and
Sweep Safeguard
Circulars.**

STRAND MFG. CO., INC.
SAFETY ENGINEERS
611 West Lake Street Chicago 6, Ill.

ACCURATE, COST-SAVING PERFORMANCE

on Work like this . . .



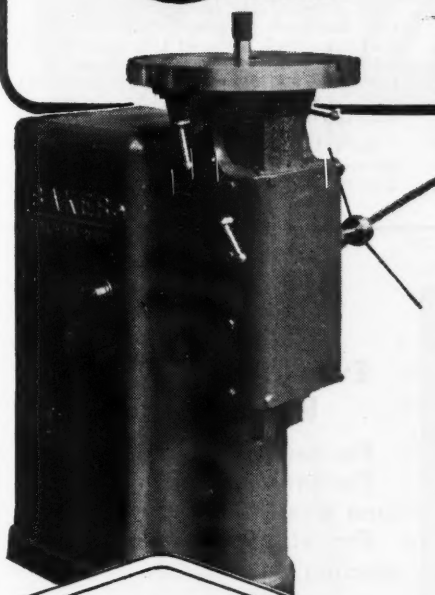
FLAT CAM



DIE



LEVER



Contour Grinding is *rapid, economical and accurate* . . . with this Baker Model No. 3 Grinder. Performs hand grinding which other types of grinders won't readily handle. Has vertical reciprocating movement of spindle— $\frac{3}{16}$ ". Diamond dresser is standard equipment and is quickly mounted.

Capacity, diameter of wheels— $\frac{1}{2}$ " to 4". Capacity, face of wheels—2" - $2\frac{1}{2}$ "-3". Diameter of table 18". Write for illustrated circular.

MODEL 3

BAKER

CONTOUR GRINDER

BAKER BROS., Inc., Toledo, Ohio

DRILLING, BORING, TAPPING and KEYSEATING MACHINES

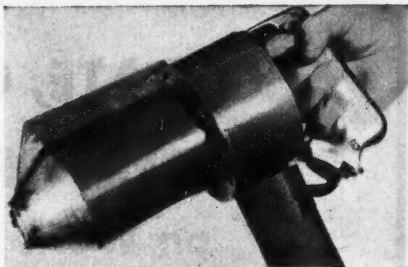
push-button control.

The Oster No. 650 Semi-Automatic Lathe measures 50 inches high x 44½ inches wide x 72 inches long overall and weighs approximately 3,000 lb. The machine is regularly furnished complete with motors, controls, and related equipment, but without tools.

Tocco Induction Heating Equipment

The Tocco Division of The Ohio Crankshaft Co., Cleveland, Ohio, announces the development of four new pieces of induction heating equipment; namely, (1) the Tocco Heat Gun, (2) a 30,000-cycle motor-generator type induction heating unit, (3) a variable ratio transformer, and (4) a 7½ kw. output, 3-megacycle induction heating unit.

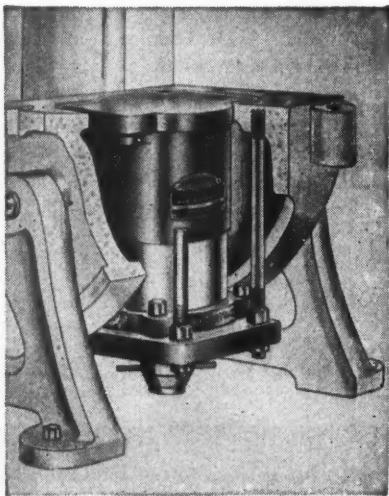
A portable inductor, the Tocco Heat Gun is said to be particularly adaptable to large cumbersome assemblies where many spot-heats are required or to short production runs where it is uneconomical to provide a special inductor coil for each part to be treated. The heat gun, which may be used with leads up to 20 feet in



Tocco Heat Gun

length or longer, is controlled by a simple trigger switch and utilizes a multiple turn coil in obtaining the necessary high flux density in the area being treated, with a relatively low current supply. In this manner, long leads of moderate dimensions can be used to transmit power with high efficiency. The gun is built for operation with the standard 10,000-cycle motor-generator type induction heating unit.

Said to triple the previous high frequency limit of the company's motor-generator type induction heating equip-



Die Cushions

for

Every Punch Press Requirement

For deep drawing operations.

For pressure pad control on form dies.

For stripping blanks and ejecting slugs.

Write for Engineering
Catalog No. 100-12.

**DAYTON ROGERS
MANUFACTURING CO.**
Minneapolis 7, Minnesota



*You can get
perfect threads
with **BATH TAPS***

Yes, you'll thread perfectly with BATH TAPS if you take proper care of them.

Lubricate them well. Run them fast. Watch alignment. Keep them sharp. Don't force them. Don't allow flutes to clog. Don't use a worn-out holder.

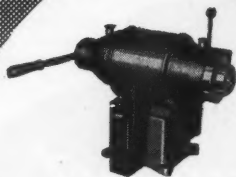
BATH TAPS are precision ground from the solid after hardening to assure you accuracy and long life. Use them properly to get the most out of them.

TAPS AND THREAD GAGES

John Bath & Company, Inc.

WORCESTER

MASS.



SCHAUER SPEED LATHES

are production necessities in any plant, for economical, speedy finishing, polishing, de-burring or lapping small parts.

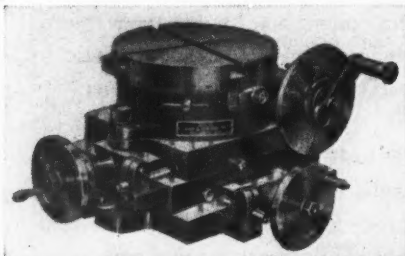
There is a size and type for your particular needs. For complete information

Write for Catalog 440

The Schauer Machine Co.

Originators of Today's Speed Lathes
2060 Reading Rd. Cincinnati 2, Ohio

No. 1 COMPOUND TABLE With 7½" Dial Type Rotary Table Mounted



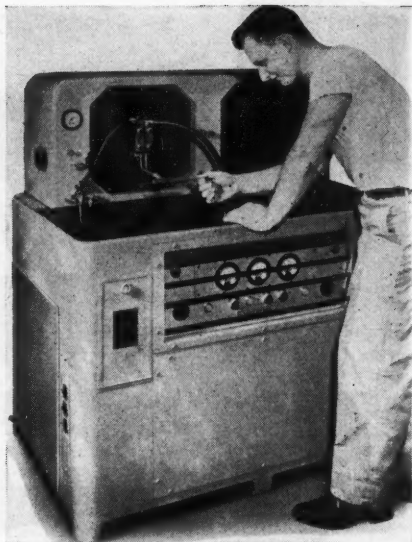
We also make a No. 2 Size for 12" Rotary Table. Can be had without Rotary Table.

Write for Bulletin.

Rotary Tables • Multiple Spindle Index Centers • Vises • Screw Machines • Screw Head Slotters.

John B. Stevens Inc.

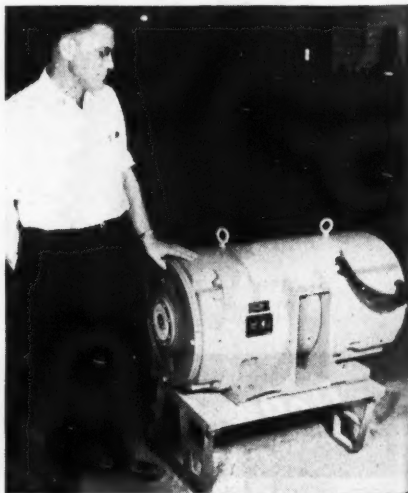
482 Canal St. New York 13, N. Y.



Tocco 7½ Kw. Induction Heating Unit

ment, the Tocco 30,000-Cycle Induction Heating Unit is described as highly satisfactory for the surface hardening of parts both smaller and larger than ¾ inch in diameter.

Tocco 30,000-Cycle Induction Heating Unit





Presenting **END MILLS by RELTOOL!**

in a complete range of styles and sizes

In addition to its established lines of Reliable Metal Cutting Tools, Reltool now offers you End Mills of finest high speed tool steel... accurately made, and scientifically heat treated and case hardened for long life. They are made in single and double-end types, in small and large diameters, with 2, 3 and 4 flutes, and with straight or ball-ends.

Ask about the Reltool Franchise

Choice territories are still available to Industrial Distributors who can provide Adequate Sales Representation for the fast growing Reltool Line.

The RELTOOL Line Includes:

- "SHOCKLESS" Center Drills, Regular and Bell Type
- Standard Center Drills, Regular and Bell Type
- End Mills
- Center Reamers
- Tool Bits
- Circular Saws
- Slitting Saws
- Screw Slotting Saws
- Formed Tooth Saws
- Side Chip Clearance Saws
- Jewelers' Saws
- Rotary Shears and Special Saws made to Order
- Cut off Blades
- Lathe Mandrels
- Keyseat Cutters

Reltool CORPORATION
RELIABLE METAL CUTTING TOOLS

710 WEST MICHIGAN STREET

MILWAUKEE 3, WISCONSIN

February, 1947

A 5122-1P-A
MODERN MACHINE SHOP 257



Tocco Variable Ratio Transformer

Designed to increase the adaptability of motor-generator type induction heating equipment, the new variable ratio

transformer can be made to match any size load and any size inductor coil by a simple change of leads, thereby reducing change-over time to a minimum and making one transformer suitable for all jobs.

The Toccotron 7½ Kw. Induction Heating Unit is an electronic type which operates at about 3 megacycles, and is designed to increase efficiency in the heating of parts of very small diameter or very thin strip stock.

Rogers Type NT-20 Electronic Face and Knife Grinder

Featuring adjustable speed which is accurately controlled by a simple finger-tip device, an electronically-driven face and knife grinder designated as the Type NT-20 has been brought out by Samuel C. Rogers & Co., Buffalo, N. Y. The design includes an electronic panel, complete with rectifiers and their supporting tubes and circuits.

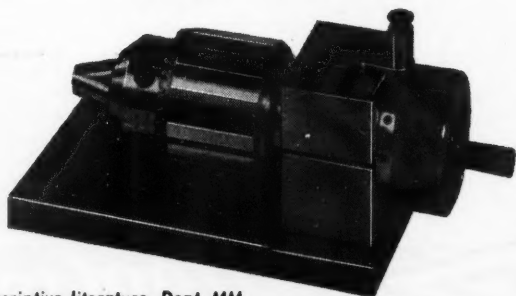
According to the manufacturer, the Rogers NT-20 Grinder can be easily controlled by even an inexperienced operator. A single finger-tip dial on the front of the machine permits speed changes

Sta-Ga-Co ROTARY GRINDING ATTACHMENT

FOR SURFACE GRINDERS

SAVES 50%

in grinding small intricate production or tool parts. Has countless applications in every tool room. Light, compactly-built and indexed for accurate grinding.



Write now for complete descriptive literature, Dept. MM

Mfd. by *Star Gauge Company*, Box 83, Highland Sta., Springfield, Mass.



**You Can Grind It
faster, smoother,
cleaner with**

**ECONOMY
LUBRICANT
1888**

... and it's so easy to mix with water!

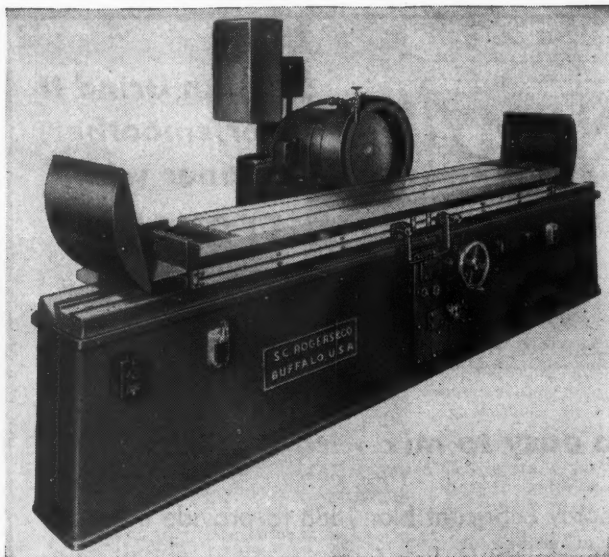
The ability of Economy Lubricant No. 1888 to provide unusually clean and free cutting wheels, fine finish, rapid chip settling, is helping many firms improve and speed production.

A well-known concern reports: — grinding with the side of the wheel — usually a troublesome operation — wheels last two to three times as long between dressings when using 1888.

We can show you how 1888 can work for your benefit to insure long life and excellent surface.

Send for circular which describes the many unusual features of the new Economy Lubricant 1888.

THE WHITE & BAGLEY COMPANY
WORCESTER 8, MASS., U.S.A.
Original Producers of Grinding Lubricant



Rogers Type NT-20 Electronic Face and Knife Grinder Set Up for Face Grinding

switches with reversing levers are adjustable to the length of traverse desired.

An ordinary a.c. source of power is all that is said to be required to drive the 10 h.p. motor. Connection to direct current is automatically made through the electronic panel.

The Rogers Type NT-20 Grinder is equipped with a 72-inch long x 16-inch wide table and a 20-inch cylinder grind-

ing wheel. Designed especially for the high, steady production of iron and steel parts, the machine is adjustable for grinding long or narrow recess areas or solid sections up to 12 inches wide. When fitted with a revolving knife holder, the Type NT-20 is said to be suitable for the production or maintenance grinding of flat parts, knives, or shear blades with infinite accuracy.

within the range of 5 to 70 feet per minute while the machine is running. The electronic drive enables the operator to select the proper speed for each kind of work—slow traverse for heavy cuts or fast traverse for light cuts with high finish.

The table traverse is initiated by merely pushing the starting button on a d.c. motor. The speed adjusting finger-tip dial can be preset for any speed within the specified range. The motor arrives at the preset speed smoothly as a result of the constant current-limit acceleration provided. Reversing, quick stopping, and complete control are automatically provided for in both forward and reverse operations. Smooth contact limit

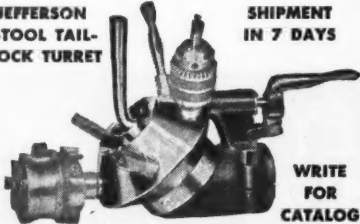
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Huppert No. 5 De Luxe Furnace

Identified as the Huppert No. 5 De Luxe, an automatically controlled furnace for precision use in laboratories.

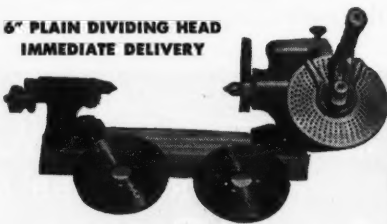
**JEFFERSON
5-TOOL TAIL-
STOCK TURRET**

**SHIPMENT
IN 7 DAYS**



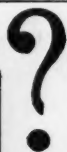
**WRITE
FOR
CATALOG**

**6" PLAIN DIVIDING HEAD
IMMEDIATE DELIVERY**



JEFFERSON MACHINE TOOL CO., • 702 W. 4th St., Cincinnati 3, Ohio

Are you concerned with heavy duty turret lathe operations



if so —

HERE'S A
WORTHWHILE
SUGGESTION

Cushman Heavy Duty and Extra Heavy Duty Chucks, designed and built "from the ground up" especially to meet the demands of modern turret lathe operation are equipped with American Standard 2-piece jaws and Serrated 2-piece jaws respectively. The construction of these precision chucks fully qualifies them for continuous service under heavy feeds and at high speeds with carbide tools. The two piece jaw equipment permits the use of formed soft blank top jaws...at a cost far below that of special jigs or set-ups...when irregular shaped work pieces are being machined. It is likewise easy and economical to change from one set of jaws to another without dismounting the chucks.

Whether your needs in work holding equipment are "standard" or "special" Cushman can supply a cost saving answer out of the long experience of our Engineering Department. Call upon us without obligation.

THE CUSHMAN CHUCK COMPANY • Hartford 2, Connecticut

A WORLD STANDARD FOR PRECISION



You can depend upon your Cushman Distributor for expert, experienced assistance in the solution of your work holding problems. Call on him.

**CUSHMAN
CHUCKS**

February, 1947

MODERN MACHINE SHOP 261



Huppert No. 5 De Luxe Furnace

small unit and batch production work has been developed by the K. H. Huppert Co., 6830 Cottage Grove Ave., Chicago 37, Ill. The unit features a combination three-

way heat range switch and an automatic temperature timer which allows the operator to maintain constant temperatures ranging from 200 to 1,800 deg. F. with a minimum variation of not more than 10 deg., and also to bring the furnace to heat fast or slow as desired.

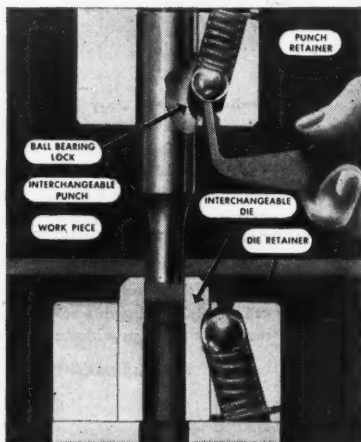
The heating elements of the Huppert No. 5 DeLuxe Furnace are of high-temperature alloy wire while the furnace itself is of all-steel construction with a black wrinkle finish. To ensure maximum retention of heat, the unit is heavily insulated, and the door is counterbalanced to ensure complete closure while in operation. The furnace proper is divided from the base by a transite spacer, thus preventing excessive temperatures in the lower base where the instruments are located.

A built-in temperature controller and heat range switch, a pyrometer, two porcelain loading trays, and two pilot lights for indicating operation of the furnace are included as standard equipment. The dimensions of the work chamber are 4 $\frac{1}{2}$ x 3 $\frac{3}{4}$ x 9 inches, and the overall dimensions of the furnace are 19 x 21 x 21 inches. The throat of the furnace measures 2 inches, and the maximum operating temperature of the unit is 2,000 deg. Fahrenheit.

PUNCHES and DIES *are Quickly* **INTERCHANGEABLE**

Allied's R-B Interchangeable Punches and Dies are quickly installed for trouble-free production in the metal-working and plastics industries. They are available from stock in *standard* round, oblong and square shapes of almost any required size. Specials of any size, shape or material are promptly furnished to your specifications—and delivery dates are *dependable*.

Write today for large Illustrated R-B Catalog.



ALLIED PRODUCTS CORPORATION

Department 21 • 4624 Lawton Ave., Detroit 8, Michigan

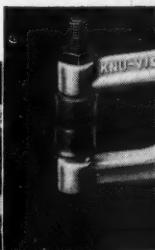
THE PLIERS

FOR QUICK CLAMPING
AND RELEASING

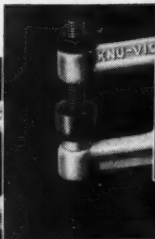
WHERE WORKING SPACE
IS LIMITED



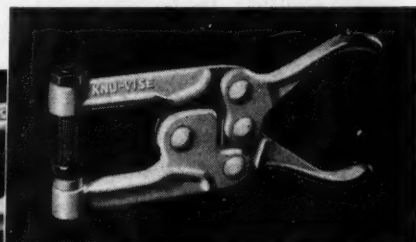
P-400-FG



P-402



P-401



P-400

Model P-400—A handy portable vise to hold work for drilling, welding, riveting, etc.—spindle adjustable to accommodate 0" to $\frac{1}{16}$ " of thicknesses.

Model P-401—Rubber cap on spindle serves as protection when two different materials must be held together. Curved handles make for comfortable operation.

Model P-402—Has two rubber caps—especially desirable where both surfaces of material held require protection, such as fine woods, etc.

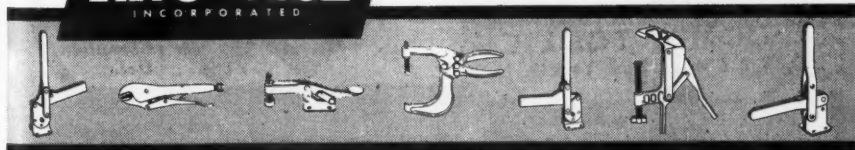
Model P-400-FG—Requires no presetting—spindle automatically adjusts itself to varying thicknesses of materials held—from 0" to $\frac{3}{8}$ ".

Toggle action enables operator to apply and release pliers with simple, effortless motion. Screw driver slot in spindle is used to preset required pressure. Normal hand pressure attains 400 pounds. Pliers are made of forged steel, cadmium plated—also available in larger sizes.

KNU-VISE
INCORPORATED

2200 Eighth St.
422 Magnolia Ave.

Detroit 16, Michigan
Glendale 4, Calif.



"Shield-O-Matic" Welding Electrode

Said to combine all the materials necessary for producing a crucible-enclosed welding arc with the requirements for continuous automatic welding, an automatic electrode to be known as the "Shield-O-Matic" is now being marketed by the Hollup Corp., 4700 W. 19th St., Chicago, Ill. A metallic grid construction that binds a heavy flux coating to the wire core provides for an electrode that is claimed to withstand extreme flexing and bending without loss of flux

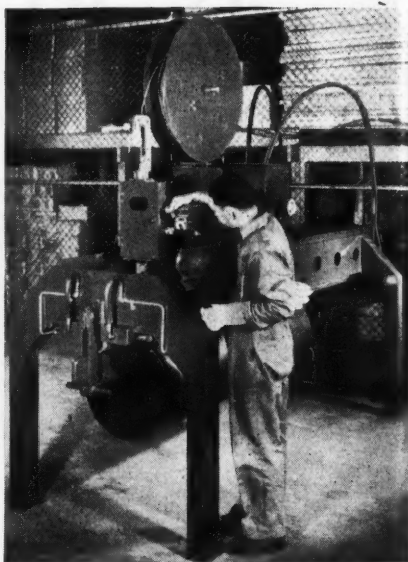


Illustration showing the "Shield-O-Matic" adapter being used to feed electrode through straightening rolls, feeding mechanism, and down through the welding-current contact jaws. This adapter may be attached to all types of welding equipment.

and which can be continuously fed into the mechanically maintained arc from a reel. Since the grid extends to the periphery, welding current is conducted through the heavy coating of flux to the inner steel core.

The fin-ridged construction of the electrode core is said to further provide for the conduction of unusually high welding currents. Its particular design causes



Fray "ALL-ANGLE" MILLING ATTACHMENT

**EASY TO HANDLE
FLEXIBLE
UNIVERSAL • STURDY**

It is an all purpose attachment which has thoroughly proved itself all over the world. Ideal for the making of plastic molds, die casting molds, permanent mold casting molds, metal patterns, tool and die making, production work of all kinds, as well as for grinding, drilling, boring, etc.

**DIRECT DRIVE OR BACK GEARED
8 SPINDLE SPEEDS 125 TO 5200**
For further information write Dept. E

NATIONAL DISTRIBUTORS
H. LEACH MACHINERY CO.
347 CHARLES ST. PROVIDENCE 4, R. I.
AGENTS IN ALL PRINCIPAL CITIES



INTERNAL THREADING AND BORING TOOLS

For holes from $\frac{1}{8}$ " upwards, 15 different sizes. The accurate thread angle is maintained through each sharpening until tool is entirely worn down. Small head-long cutting surface for regrinding.

COMET TOOL CO.
738 B'way., New York 3, N. Y.



**Write for
Complete
Data.**

STOP DUST WITH DUSTKOPS

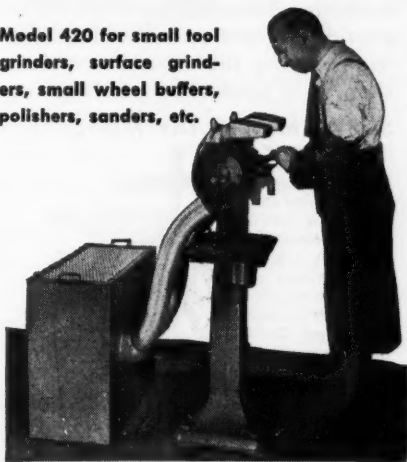


Model 1150 DUSTKOP Dust Collector collects all the chips (note pile in back of DUSTKOP) from aluminum extrusion cut-off. Paddle wheel fan direct driven by continuous duty motor clears any size chip or shaving; cyclone separator for a first stage cleaning is followed by spun glass filtering of air before recirculating to work space.

DUSTKOPS require no duct work: Install in minutes.

New style, low cost, spun glass filter, is fire-safe, easy to shake down and seldom needs renewing.

Model 420 for small tool grinders, surface grinders, small wheel buffers, polishers, sanders, etc.

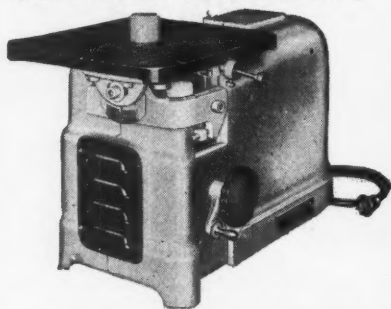


AGET-DETROIT CO.
604 First National Bldg.
ANN ARBOR, MICHIGAN
Phone 2-5585

Ask for complete information NOW on DUSTKOPS.
DUSTKOPS are LOW IN COST, EASY TO INSTALL, FULLY PORTABLE

New **HELP**

**FOR TOOL, DIE AND
MACHINE SHOPS . . .**

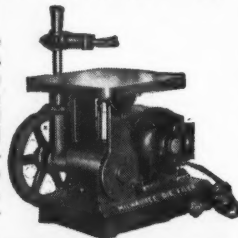


THE MILWAUKEE PROFILE GRINDER

. . . for precision grinding of interior and exterior profiles . . . curved, odd and irregular surfaces. It performs a variety of operations at substantial savings over other methods. Embodies features which provide decided operating advantages in the tool room, machine shop, or in production grinding.

SUPPLEMENTS The Milwaukee DIE FILER

— used in tool, die and machine shops for filing, sawing and lapping. Both machines are sold by Machinery and Mill Supply Dealers. Write for name of nearest dealer, and descriptive literature.

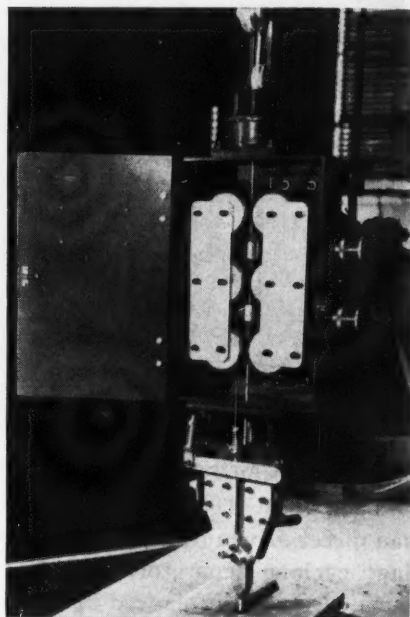


Milwaukee
CHAPLET & MANUFACTURING CO.
1041 S. 40th ST., MILWAUKEE 4, WIS.

A 5121-3/2A

the electrode and base metal to melt at an unusually fast rate, thus permitting maximum economies in metal fabrication and very high welding speeds.

Welds produced are described as exceptionally uniform due to the unique

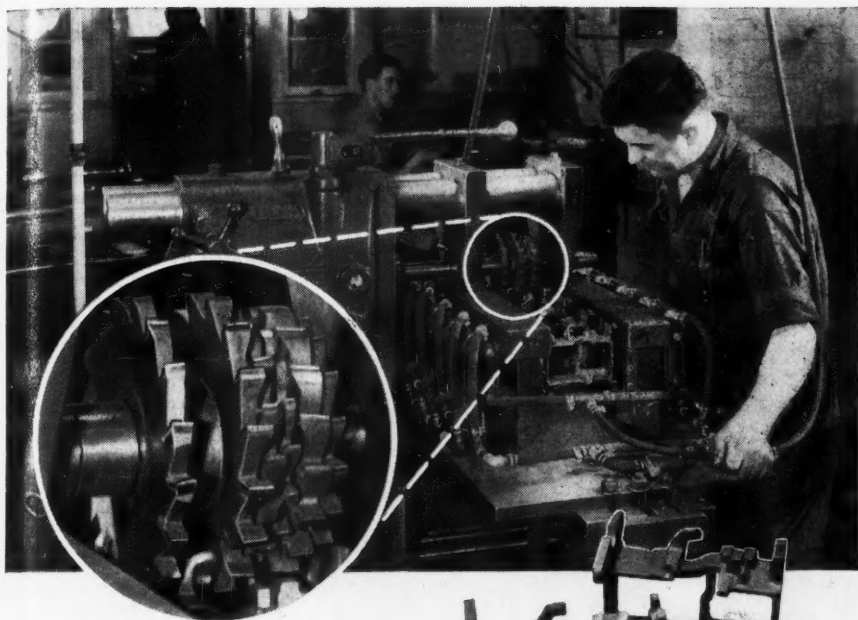


Typical design of fixture used when applying "Shield - O - Matic" process to longitudinal seams for both flat and cylindrical shapes

construction of the Shield-O-Matic Electrode, by which fluxing agents and the metallic parts of the electrode are combined in a single product to produce a highly stable arc within a crucible. Flexible and portable, the electrode is said to meet all code welding standards and is applicable to all commonly welded materials.

Bellevue Gas-Fired Die-Casting Alloying Pot

A gas-fired die-casting alloying pot equipped with a continuous type conveyor feed is now being offered in capacities from 2,000 to 10,000 lb. by the Bellevue Industrial Furnace Co., 2971 Bellevue Ave., Detroit 7, Mich. The pot,

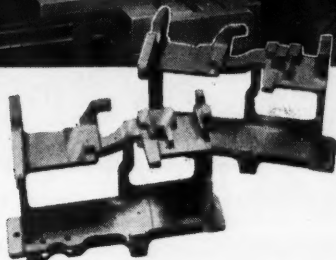


A CARBIDE MILLING OPERATION

This milling operation is being done on annealed cast iron castings with a set of six Midwest Carbide Milling Cutters. The cut is never more than .003". The operation is essentially a shaving of irregular, highly abrasive surfaces . . . extremely hard on cutting tools. Ten individual surfaces totalling approximately 4", are milled. The load per cutter tooth is .001".

The operation is run on a Kearney Trecker, Model 21, plain milling machine equipped with automatic feeds and a 3 H.P. motor. An air-operated fixture which accommodates five work pieces, is used.

More than 128 pieces are machined per hour.



This production runs 30% higher than original estimates. The cutters are worked nine hours per day, two weeks at a time, without resharpener.

Midwest engineers can assist on *your* Metal Cutting Problems. Their recommendations are based on Midwest's 35 years of designing and manufacturing standard as well as highly-engineered, special application Metal Cutting Tools. Let us analyze your production tooling.

Bulletin 1042 illustrates a variety of Midwest Standard and Special Metal Cutting Tools. A copy will be sent on request.



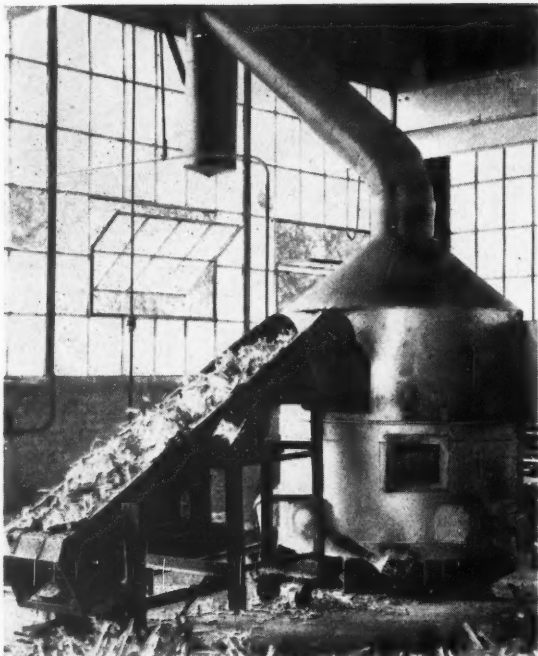
MIDWEST TOOL & MFG. CO.

2366 W. JEFFERSON AVE.

DETROIT 16, MICH.

February, 1947

MODERN MACHINE SHOP 267



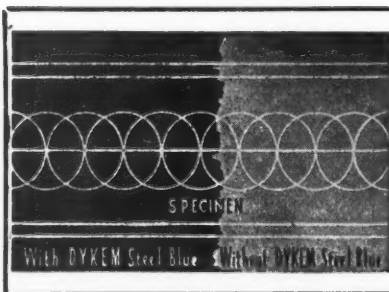
Bellevue 6,000-Lb. Gas-Fired Die-Casting Alloying Pot

which normally is arranged to be fed to capacity every hour, is intended for use in die-casting plants for reclaiming sprues and other scrap material and can also be employed for alloying die-cast metal. Standard size units are furnished in capacities ranging from 2,000 to 10,000 lb. per hour and with temperature ranges from 350 to 1,200 deg. F. Special sizes of the alloying pot can be supplied to meet customer's specification.

"Pulsolator" Automatic Oil Lubricating System

An improved automatic oil lubricating system which can be engineered to meet practically all lubricating problems on industrial machinery, to be known as the "Pulsolator," is now being marketed by Rivett Lathe & Grinder, Inc., Brighton, Mass. Not limited as to the type of lubrication it can provide nor by the number of bearings involved, the system, according to the manufacturer, can be arranged to provide controlled oil delivery by gravity or under pressure to selected bearings and, at the same time, direct continuous flood lubrication to enclosed bearings and gear trains.

The Pulsolator Automatic Oil Lubricating System may be built as an integral part of a new machine or installed on an existing machine. It consists of a central pumping unit with reservoir; an oil supply line which runs from and returns to the pumping unit; and metering feeders mounted along the oil supply line in proximity to their respective bearings. The size and reservoir capacity of the pumping unit varies with the number of bearings to be lubricated; the feeders which control the oil delivery are the same for all installations. The standard pumping units with reservoir capacities from 1 quart to 55 gallons are capable of lubricating from 1 to 400 individual bear-



DYKEM STEEL BLUE

Stops Losses in Making Dies and Templates

Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy. Write for full information.

THE DYKEM COMPANY

2301F NORTH 11th ST.

ST. LOUIS, MO.

(In Canada: 2466 Dundas St. West, Toronto, Ont.)

Specify ATLANTIC

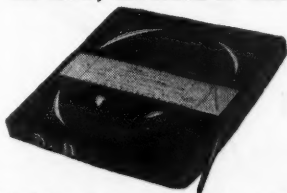
BAND SAW BLADES

For Smoother

CONTOUR CUTTING



ATLANTIC SAWS meet all of your requirements for a superior blade on complicated die and fixture radius cutting. ATLANTIC specializes in accurate milled and precision set teeth, hardened to exact temper.



Atlantic's strong, practical box, plainly marked on sides and top. Remains in good condition until entire coil is used.

ATLANTIC'S special alloy steel insures longer wear and easier welding.

ATLANTIC'S one temper saw for all metals reduces stock you have to carry. Cut to length and welded, ready for use. Packed in strong Atlantic box. Write for new Atlantic Catalog.

Atlantic Saw Mfg. Co.
INCORPORATED

Exclusively Manufacturers of Band Saw Blades
155 Brewery St., New Haven, Conn.

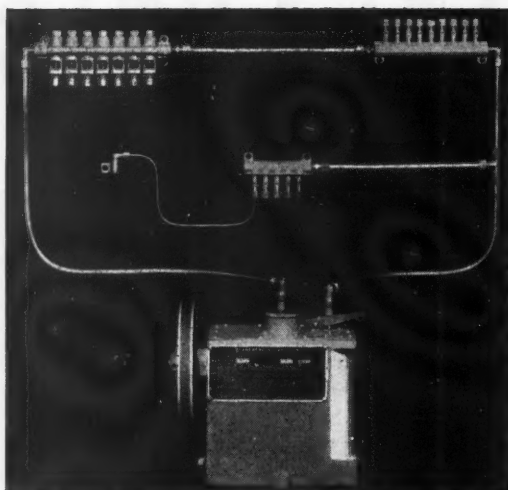


Illustration showing a typical "Pulsolator" Automatic Oil Lubricating System

ings; special pumping units are engineered to meet peculiarities of any installation. In general, the pumps are of the rotary type and are driven from a shaft on the machine or by an individual elec-

tric motor. Small single-shot units are available which can be operated by a solenoid or a lever actuated by a sliding member of the machine.

In operation, the pumping unit circulates a continuous flow of oil through the oil supply line and periodically builds up instants of high pressure, the frequency of which can be selected from once every 3 seconds to once every 12 minutes. At the instant of high pressure, the feeders mounted along the supply line open and meter predetermined quantities of oil to their respective bearings. Two types of feeders are available, each with individual adjustment so that the quantity of oil metered at the moment of high pressure developed by the pumping unit can be varied from 1 to 3 drops.

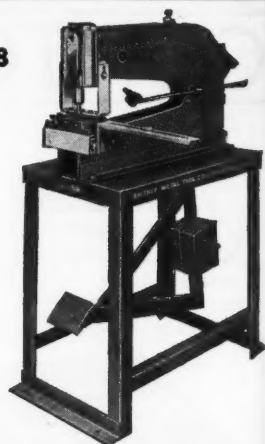
WHITNEY-JENSEN PRODUCTS
30 YEARS EXPERIENCE

Nos.
28-29-58-68

FOOT PRESSES

CAPACITY—2" Hole Thru 16 Ga.
THROAT DEPTHS—7", 10", 18", 24"
LENGTH OF STROKE—1"

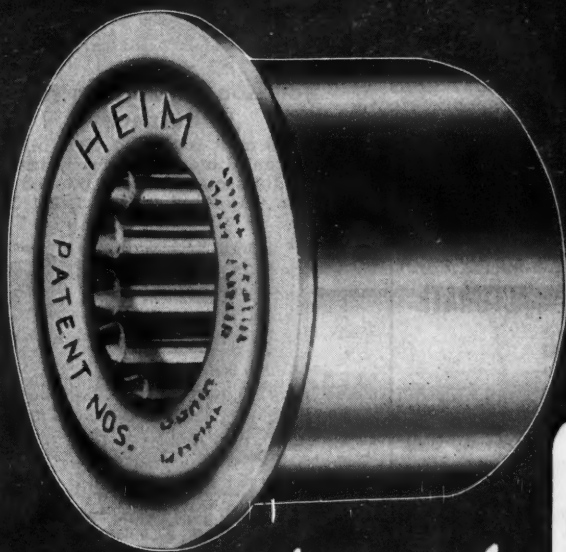
These toggle-action Foot Presses combine features that make them one of the most versatile pieces of equipment in any metal-working shop.



No. 5 JR. PUNCH

CAPACITY—1/4" Hole Thru 16 Ga.
WEIGHT—2 3/4 Lbs.

WHITNEY METAL TOOL COMPANY
110 FORBES ST. • ROCHESTER, N.Y.



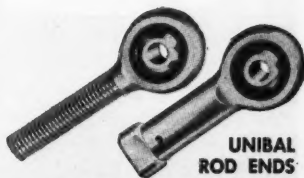
Self Contained

**HEIM
FLANGED
TYPE
ROLLER
BEARING**

The Heim Flanged Type Self Contained Roller Bearing is inexpensive and extremely simple to mount. It is only necessary to bore and ream the hole and press the bearing in. No shoulder needed against which to locate. Flange provides means for taking axial thrusts or shocks. Designed to retain lubrication and exclude dirt and foreign matter. Made in two types — light duty for use where r.p.m. is low and loads light; and a heavy duty, heat treated bearing for heavy loads.

**PROMPT DELIVERY
ON STANDARD SIZES**

**HEIM ALSO MAKES . . .
UNIBAL SPHERICAL BEAR-
INGS • SPHERICAL BEARING
ROD ENDS • DIE POLISHING
MACHINES.**



**UNIBAL
ROD ENDS**

THE HEIM
FAIRFIELD



COMPANY
CONNECTICUT

The accompanying illustration shows the improved pressure type "window" feeder through which the flow of oil and action of the needle valve may be watched at all times and adjusted to the needs of its bearings. The gravity type feeder has a similar needle valve construction, is adjustable, and includes a sight glass through which the drops of oil may be observed as they flow by gravity to the bearing.

Machine tools, punch presses, printing presses, rubber mills, textile, paper and plastic machinery are some types of equipment now being lubricated by

means of the Pulsolator System, which is said to be adaptable to practically every known type of industrial equipment.

Johnson 616 Metal Melting Furnace

Said to melt 600 lb. of lead in 29 minutes, a metal melting furnace designated as the Johnson 616 is announced by the Johnson Gas Appliance Co., 571 E Ave-



Johnson 616 Metal Melting Furnace

nue, N. W., Cedar Rapids, Iowa. The furnace is equipped with six atmospheric fired Johnson Direct Jet Bunsen burners, each having an independent shutoff valve and a pilot light. Heavy insulating refractory is provided around the removable pot to retain heat and minimize operator fatigue.

SIMPLE — FAST — ACCURATE LOCATING



SIMPLE

Place instrument in spindle of boring mill (vertical or horizontal), drill press or jig borer.

FAST

200 - 1000 r. p. m. Bring thumb nail to bear against centering head until it runs true. Stop machine and focus on work. Keep eye at least 4 inches from viewing aperture.

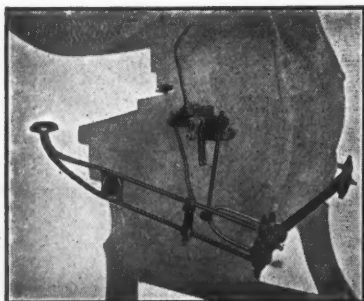
ACCURATE

Locate cross lines on work to match lines in viewing aperture.

Write for
catalogue No. 12

CENTER SCOPE PRODUCTS

3829 San Fernando Rd., Glendale 4, Calif.



SAFETY EQUIPMENT FOR POWER AND FOOT PRESSES

Combination Gate and Barrier Guards
Two-Hand Safety Starting Devices
Sweep Guards . . . Single-Stroke Attachments
Stock Reels . . . Fly Wheel Guards, etc.

Write for Details

JOHN HUMM SAFETY EQUIPMENT CO.

251 SHEFFIELD AVE.

BROOKLYN, N. Y.



From A to Z .. the Right Bur for the Job

Choose the right bur for each job and you have a profit-maker at work for you. Each Pratt & Whitney Keller bur is *right* for its own special work — because it's *engineered* for the job.

From "A" to "Z" there's a P&W bur of proper design with the right depth of cut, rake, spiral direction and contour — for *your* jobs. There's a right speed for each to remove metal swiftly and leave a fine finish. These burs retain their cutting action under long and heavy service demands . . . can be resharpened when finally worn dull.

How can you fit the right Keller bur to your job? Let a P&W Engineer advise you. Call upon P&W for this valuable help.

PRATT & WHITNEY

Division NILES-BEMENT-POND COMPANY
KELLERFLEX SALES DEPARTMENT
WEST HARTFORD 1, CONN.

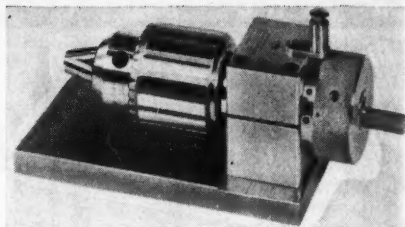


According to the manufacturer, pot temperatures up to 1,500 deg. F. can be quickly reached with six burners and held at working level with three burners, thus providing for substantial savings in both time and fuel in melting such metals as lead, babbitt, tin, zinc, aluminum, and type metal.

Sta-Ga-Co Rotary Grinding Attachment

Designated as the Sta-Ga-Co, a rotary grinding attachment which can be attached to the magnetic chuck of a surface grinder for grinding cylindrical, flat, or other surfaces to a high degree of accuracy from the raw, hardened stock is now being marketed by Bancroft and Forssen, 64 Monmouth St., Springfield, 9, Mass. The attachment is recommended for use in the production of bushings, punches, step studs, radii, flats, round slots, longitudinal slots, plug gages, and miscellaneous pieces.

The Sta-Ga-Co Rotary Grinding Attachment is said to have a grinding accuracy of within 0.0005-inch (round). The dividing head has 12 divisions, accurate to 4 minutes. The attachment is equipped

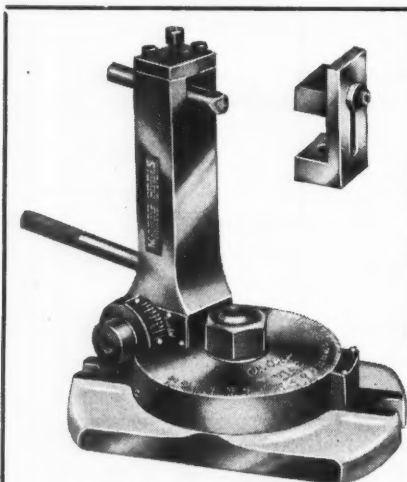


Sta-Ga-Co Rotary Grinding Attachment

with a spindle having a $\frac{1}{8}$ -inch hole straight through, and has a bearing which is lapped for accuracy and adjustable for wear. The unit has a chuck capacity (Jacobs No. 34) of from 0 to $\frac{1}{2}$ inch and weighs approximately 10 pounds.

Zagar Special Collet Fixture

A specially designed collet fixture for increasing the usefulness and stepping up the production of standard plain grinding machines is announced by



Wheel Form Dressing

GREATLY SIMPLIFIED

AN ADJUSTABLE DIAMOND WHEEL DRESSER WITH GRADUATED BASE AND TILTING COLUMN TO SET A DESIRED RADIUS

This new tool mounts on a cutter or surface grinder to handle any form of radius dressing, concave or convex, to a 1" circle and dresses up to 10" O.D. wheel. Setting block may be adjusted by micrometer, depth micrometer or "Jo" blocks.

Sturdy, accurate—inexpensive.

**Price not including diamond—\$78.00
F.O.B. Chicago.**

Sent on approval.

**See our display in the March Chicago
Production Show at the Stevens Hotel**

MATCO TOOL COMPANY

LAKE AND MOZART ST.

Est. 1934

CHICAGO 12, ILL.

Mfrs. Precision Vises and Wheel Dressers

BETTER TOOLS FOR BETTER JOBS

High quality work demands high quality tools . . . tools of advanced design made with the best materials by veteran craftsmen . . . tools such as those that bear the famous Millers Falls trademark.

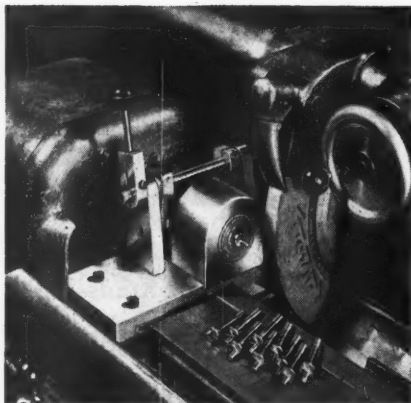
Machinists' and precision tools of all types are included in the extensive Millers Falls line. You can rely on them all for utmost accuracy, perfect performance, and lasting durability. Write for details.

One thing in common - Quality

**MILLERS FALLS
TOOLS**

SINCE
1868

**MILLERS FALLS
C O M P A N Y
GREENFIELD • MASSACHUSETTS**



Zagar Special Collet Fixture set up on a grinder for use in grinding gearless multiple drillhead cranks

Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 17, Ohio. Used to grind parts without centers which can be held in collets, the fixture operates on its own ball bearings and is driven by the head-

stock of the machine on which it is installed. The collet can be opened and closed while the grinder is in operation, and, since the collet does not move lengthwise, overall dimensions can be maintained.

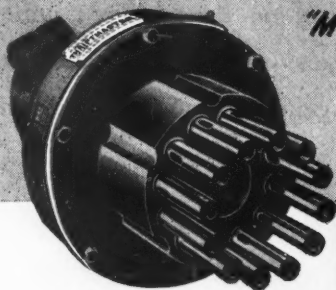
According to the manufacturer, the Zagar Special Collet Fixture can be easily adapted to any make or model of grinder and its use involves no extra or special attachments. The accompanying illustration shows the fixture set up on a standard Landis grinder for use in grinding the eccentric of a crank for a Zagar 2000 Series gearless multiple drillhead. The average rate of production is said to be 40 cranks per hour using the special collet fixture, which has a maximum collet capacity of 2 inches.

Reed-Prentice 12V Universal Head Milling and Diesinking Machine

Designated as the 12V, a universal head milling and diesinking machine for tool-room work, particularly in the making of plastic and rubber molds, diesinking dies, forged dies, jigs, and fixtures, is announced by the Reed-Prentice Corp., Worcester 1, Mass. Its design, including

FULL BALL BEARING CONSTRUCTION

"Multiple Barreled" Profit Makers



12 Spindles on fixed centers. For Drilling, Tapping, Reaming, Counter-sinking, End Milling, Spot Facing, Hollow Milling.

Special fixed-center THRIFTMASTER Drillheads to your blueprints. Standard Adjustable Drillheads are the popular 2- to 6-spindle in capacities to 1½" drills. Recommendations for standard or special drillheads made promptly and without obligation.

FIXED CENTER and STANDARD ADJUSTABLE

Drillheads

THRIFTMASTER

Reps. in CHICAGO Gatz-Arnold Co., 1553 West Madison Street
CLEVELAND T. I. France Tool & Supply Co., 12413 Euclid Avenue
PITTSBURGH Voss Machinery Co., 2881 West Liberty Avenue
BOSTON A. B. Sharvin Co., 258 Park Square Building
DISTRICT R. E. Parsh Co., 2240 Fenwick Avenue
Dealers in most cities

THRIFTMASTER PRODUCTS

DIVISION

THOMSON INDUSTRIES, INC.

25-25 Review Avenue, Long Island City 1, New York

1897

**Our
Golden
Anniversary
Year**



1947

**Fifty Years
of
Pioneering
and Progress**

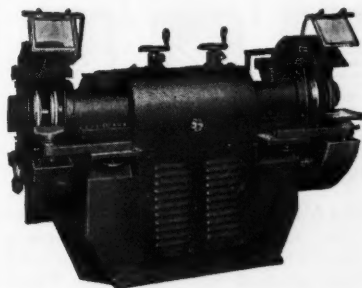
MAKE 1947 A BETTER YEAR IN PRODUCTION OR MAINTENANCE

"YOU can't do a good job without good tools" . . . since 1897 we've been supplying the best electrical tools for all industry . . . and now as our fiftieth year dawns thousands of plants, large and small, testify to the soundness of that statement. So . . . make sure your electrical tools are right, up-to-date.

**✓ Check Your Tool Inventory
Bring Your Needs Up To Date**

**Contact Your Distributor
for these
UNITED STATES
ELECTRICAL TOOLS**

Portable Electrical Drills
Bench and Floor Buffers
Bench and Floor Grinders
Valve Seat Grinders
Valve Refinishing Shops
Portable Grinders
Portable Surfacers
Portable Polishers
Portable Sanders
Flexible Shaft Machines
Portable Tappers
Bench and Floor Polishers
Portable Electric Saws
Portable Electric Hole Saws
and other items.

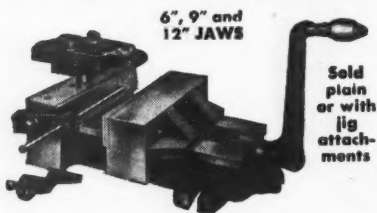


**DUAL MOTOR VARI-SPEED SNAGGING
GRINDER—Model 62 VS**

*For vitrified or high speed wheels
Constant peripheral speed for each wheel
results in increased production and longer
wheel life. Wheel guards are adjustable to
wheel wear; interlocked with speed changer,
to prevent over-speeding of grinding wheels.
Totally enclosed fan-cooled, ball bearing
motors.*

The UNITED STATES ELECTRICAL TOOL Co.
CINCINNATI, OHIO

GRAHAM MULTI-PURPOSE VISE



6", 9" and
12" JAWS

Sold
plain
or with
jig
attach-
ments

Saves hundreds of toolmaking hours, by serving as jig or fixture for all sorts of accurate, repeat-operation work. Many special jaws, stops, guides, etc. Sizes up to 124 lbs. for drill press, miller, radial, shaper, planer, grinder.



GRAHAM
"Adjust-angle"
Knurl Holder



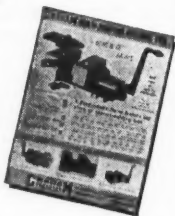
Using Only STRAIGHT Knurls

Fitting lathe turret, this tool permits adjusting the angle of straight knurls to cut a variety of straight, spiral and checkered patterns on work up to 2½" dia. Shank made to fit your turret.

BULLETIN 41

describes both of these tools, with Attachment and Price Data.

SEND FOR IT



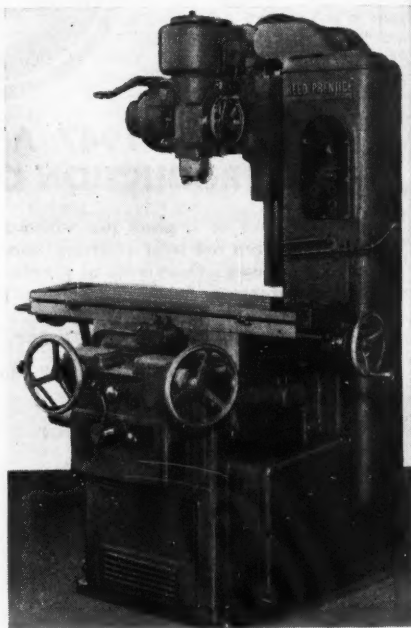
GRAHAM MFG. CO.

39 BRIDGE ST.

EAST GREENWICH, R. I.

universal head, centralized control panel, infinitely variable feeds and spindle speeds, is said to make the machine ideal for diesinking, duplicating, boring, drilling, face or straddle milling.

The quill type milling and boring head is mounted on an adjustable ram. Spiral bevel gears on the spindle drive provide for smooth, quiet power transmission to the spindle. Extra wide ways are incorporated for table, cross slide, and ram



Reed-Prentice 12V Universal Head Milling
and Diesinking Machine

movement. Cross and longitudinal ways and feed screws are automatically lubricated by a one-shot lubrication system and are fully protected from chips and dirt. All gearing is centrally located at the front of the machine and is readily accessible by the removal of one panel. The construction also includes built-in provision for chip removal from the table ways.

The head is mounted on a sliding ram and can be adjusted for all angles up to 45 deg. front to back and 30 deg. left to right. It can also be depressed to a horizontal position for milling with an arbor.

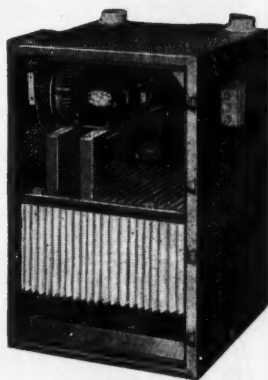
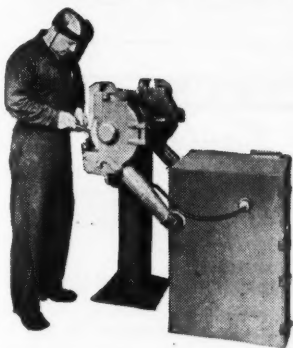


In factories, as well as homes, the dust problem is serious. Stop dust at its source with:

TORIT DUST COLLECTORS

Collect dust right at the machine with TORIT Dust Collectors. Self-contained units, they eliminate extensive piping, and cut operating costs. Cleaned air is recirculated into the room.

Completely portable, TORIT Dust Collectors fit into all production layouts, and may be moved as necessary. Sizes range from $\frac{1}{3}$ HP to 3 HP, with connections designed to fit all standard machines.



For details and latest TORIT catalog write:

TORIT MANUFACTURING CO.
296 Walnut Street St. Paul 2, Minn.

A single push-button control station mounted on the front of the column contains all push buttons, speed and feed controls. Two levers control directional feed and rapid traverse of the table, front and back or right and left. Infinitely variable spindle speeds from 90 to 2,200 r.p.m. are obtainable through a Reeves drive and one back gear. An infinite feed rate of from $\frac{1}{8}$ to 16 inches per minute is available. Automatic adjustable feed steps for the table, cross saddle, and vertical saddle are provided.

The electronic feed drive provides a feed range of approximately 100 to 1;

namely, from $\frac{1}{4}$ to 24 inches per minute for the table and saddle and from $\frac{1}{8}$ to 16 inches per minute for the ram. A one-step rapid traverse is also incorporated. The d.c. motor is rated 1 h.p., 1,750 r.p.m. The electronic unit is of the constant torque, half-wave rectification type and has current limiting, dynamic braking, and no-voltage release circuits. The motor is a reversing type, and operation is accomplished through five-position levers for feed and traverse in both directions, plus a neutral position. Adjustable limit switches are provided.

Standard equipment of the Reed-Prentice 12V Machine includes a 3 h.p. 1,800 r.p.m. 60-cycle spindle motor and control, including a combination line starter (or 3 h.p. 1,500 r.p.m. 50 or 25-cycle); 1 h.p. d.c. motor with electronic control for feeds; micrometer depth stop; spindle drawbar; adapter for No. 9 B&S taper shank; standard collet chuck with No. 9 B&S taper shank and tang end; one $\frac{1}{2}$ -inch collet; adjustable lamp bracket; and wrenches.



RIVETERS



• Pioneers in the riveting field. Head rivets from smallest to $\frac{1}{4}$ " diameter, either by noiseless spinning or vibrating hammer method.—Sizes to meet all needs.—Types include Vertical and Horizontal Multiple Spindles. Write for literature—and don't forget to send samples.


THE GRANT MFG. & MACHINE CO.
96 Stillman Ave. Bridgeport 5, Conn.

Black & Decker 6-Inch Heavy Duty Bench Grinder

A 6-inch heavy duty bench grinder designed for use in performing grinding, tool sharpening, wire brushing, and buffing operations has been developed by the Black & Decker Manufacturing Co., 720 Joppa Rd., Towson, Md. The design includes modern streamline housings of die-cast zinc which provide for maximum working clearances and minimum weight.

The grinder is equipped with strong steel wheel guards and covers which afford operator protection and are said to meet all safety requirements besides being wide enough to accommodate a standard three-section wire wheel brush

ALL YOU WANT IN GEARS



AT A *Saving!*

Small or large gears, for the most severe duties, longest service. ABART gears, exactness and precision approved by thousands of users. Spur, bevel, worm, helical and spiral, internal, of any gear material. No stocks. Send B/P or specifications for quotation.

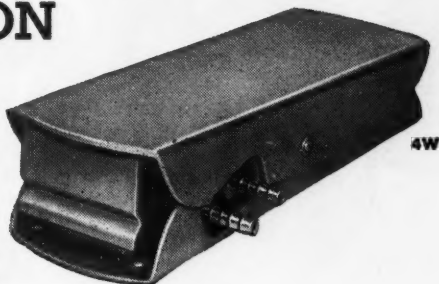
ABART GEAR AND MACHINE CO.
Mrs. of Speed Reducers and Gears
4819 WEST 16TH ST. CHICAGO 50, ILL.

READY *the new* **MEAD**

COMBINATION

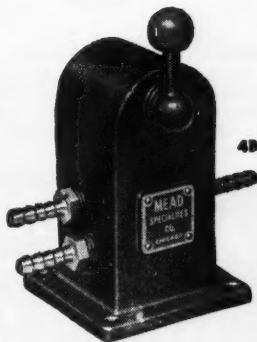
3 or 4 WAY

AIR VALVE



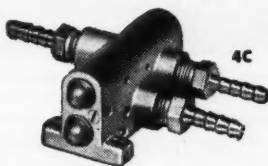
This new, ingenious MEAD VALVE is almost universal in its uses yet is so simply constructed it gives long, troublefree service. No sliding closures . . . 1/16" movement operates from full open to full closed helping speed of action, minimizing operational fatigue.

4B BENCH VALVE . . . for use on machine table or bench. Functions as a 4-way valve . . . two 3-way valves . . . one 3-way valve . . . and as a 3-way valve and a blower!

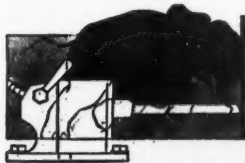


4W FOOT CONTROL . . . pedal works valve either as 3- or 4-way. Adjustable pedal stop provides quick change from 3-way to 4-way. Same combination of functions made by rocking pedal as by moving lever of bench valve.

4C FOR CAM OPERATION . . . can be mounted on drill press, etc., for automatic control of air cylinder by suitable cam.



WRITE for new Air Power Catalog describing Mead's Air Vises, Clamps, Presses, Workfeeders, Controls, etc. Just off the press!



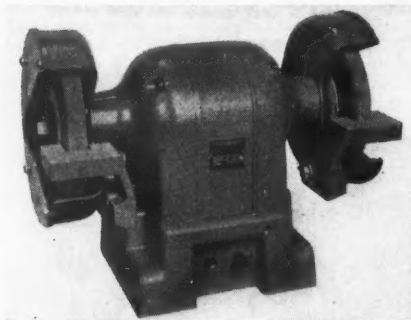
MEAD SPECIALTIES COMPANY

4114 NORTH KNOX AVENUE
DEPT. AA-27 CHICAGO 41, ILL.

without any change in the guards. Fitting around the grinding wheels for maximum support in tool sharpening are ad-

is provided on the face of the grinder base for mounting attachments commonly used on bench grinders.

The Black & Decker 6-Inch Heavy Duty Bench-Grinder can be bolted to a bench or mounted on a streamline pedestal that can be located anywhere in the shop. Standard equipment includes two grinding wheels—a medium grade for rough fast work and a fine grade for finish grinding and tool sharpening.



Black & Decker 6-Inch Heavy Duty Bench Grinder

justable U-shaped tool rests. The two-pole push-button switch used in starting the grinder is recessed in the housing to prevent accidental contact, yet is in easy reach of the operator. A machined hole

Bryant 5-Ton Air-Hydraulic Press

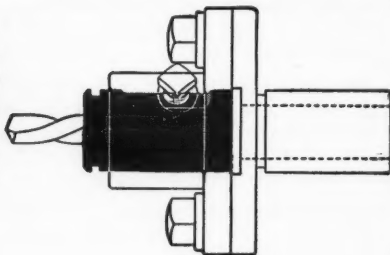
Equipped with a four-way balanced valve for easy operation and positive control, a 5-ton air-hydraulic press for bench use which is furnished complete and ready to operate is announced by the Bryant Products Co., Jackson, Mich. All working parts are contained in the housing of the unit, which includes a minimum of moving parts and can be powered by compressed air from any air line, since no specific volume or pressure is said to be required for proper operation.

Small enough for the lightest press job yet powerful enough for many heavy duty operations, the Bryant 5-Ton Air-Hydraulic Press, according to the manu-

ACRO-GRIP

ADAPTER BUSHINGS

SAVE TIME FOR
SCREW MACHINE SET-UPS



Now available for all types of tool holders and turrets. Tremendous gripping power prevents drill slippage—extreme accuracy and parallelism assured. Sold in sets or individually as low as \$1.25 each.

**Brown & Sharpe
Set Prices**

WRITE FOR FOLDER

Set No.	Holder Number	Bushing Size		Range of Set in 64ths	No. of Pieces	Net Price with Case
		Dia.	Length			
SB-103	00 AC 10-A	1/2	3/4	1/16 to 7/8	17	\$20.00
SB-105	11A 20 BA	3/4	1 1/8	1/16 to 1 1/8	25	\$31.00
SB-106	12B-14 22B	1	1 1/4	1/4 to 3/4	33	\$54.30

THE H. C. CLATFELTER COMPANY
FERNDAL 20, (DETROIT) MICHIGAN

Talk About PRODUCTION Without DIES!

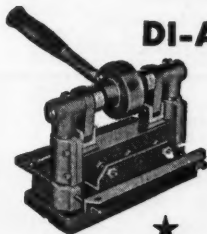
**4,000 PARTS per DAY
with DI-ACRO Bender**

"Enclosed pictures in our plant prove the DI-ACRO Bender will do a real production job. We are making 4,000 completed parts per day which is competitive to most Power Presses." (Name on Request.)

Here is an example of "DIE-LESS DUPLICATING" typical of a great variety of formed parts readily made with DI-ACRO Precision Machines, — Benders, Brakes, Shears. Picture below shows the DI-ACRO Bender making an acute right angle bend and photograph above shows the finished part formed to die precision. Women operating DI-ACRO units maintain a high out-put on production work.



DI-ACRO IS PRONOUNCED "DIE-ACK-RO"



DI-ACRO Shear

Squares and sizes material, cuts strips, makes slits or notches, trims duplicated stampings. 3 sizes. Shearing widths, 6", 9", 12".

DI-ACRO Brake

Forms non-stock angles, channels or "Vees". Right or left hand operation. 3 sizes. Folding widths, 6", 12", 18".



Send for Catalog

showing DI-ACRO Precision Machines and many examples of parts made with "DIE-LESS DUPLICATING".

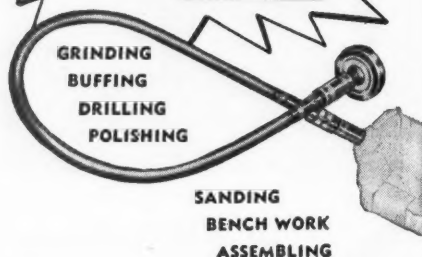


O'NEIL-IRWIN MFG. CO.

306 EIGHTH AVENUE

LAKE CITY, MINNESOTA

with a **STOW**
FLEXIBLE
TOOLSHAFT
 you can operate in
 any position



The **STOW FLEXIBLE TOOL-SHAFT** can be attached to your bench-mounted motor, or to portable power unit, either electric or gasoline. Is easy to connect and disconnect to various tools. And its ample length and easy flexing make it ideal for reaching inconvenient places.

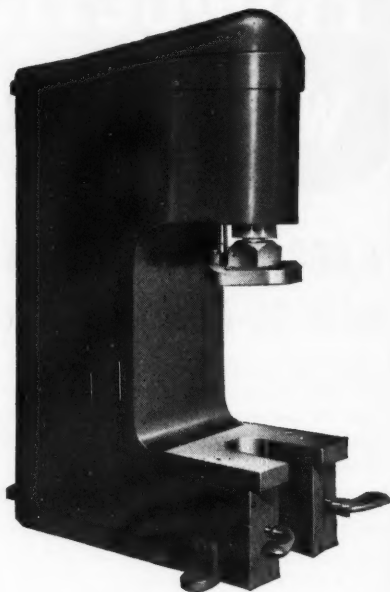
Every shop should have at least one **STOW Flexible Tool-Shaft**. For, in combination with the proper attachments, mechanics and maintenance men will find it indispensable in hundreds of important operations. Write for full details, or see your mill supplies or hardware dealer.

5-FOOT MODEL.....\$15.00
6-FOOT MODEL.....\$16.50

STOW

MANUFACTURING CO.
 1 Shear St., Binghamton, N. Y.

facturer, is designed so that die changes can be made quickly, with the unit being readily adaptable to the broaching of any work within its 5-ton capacity and 5-inch stroke. For stamping in steel, copper, wood, plastics, and so on, the controlled pressure and varying thick-



Bryant 5-Ton Air-Hydraulic Press

nesses do not affect the depth of the imprint, it is claimed. In riveting operations, whether for single or double arrangements of solid, tubular, and split rivets, the correct pressure is readily obtainable.

In assembling operations, the press can be arranged to insert metal parts, drill bushings, terminals, and so on, into molded plastic or drilled metal panels; crimp metal retainer rings, and perform many other press assembly operations. In addition, the unit can be used for various forming and bending operations, as well as punching and trimming operations. A synthetic rubber "O" ring is employed in the cylinder of the press to reduce friction to a minimum. All inside surfaces of the air cylinder which could contain moisture are hard chromium plated so as to eliminate corrosion, as well as to reduce wear to an absolute minimum.

**WOULD YOU
LIKE TO SPEED UP DRILLING
OF SMALL PARTS?**

DRILL JIGS

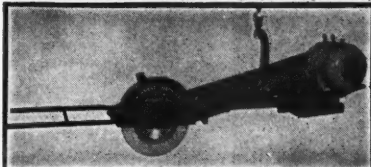
Circle 34
LITERATURE



**ESCO Engineering
Corp.**

13413 Euclid Ave.
Cleveland, 12, Ohio

MUMMERT-DIXON SWING FRAME GRINDERS



Sizes 12", 14", 16", 18", 20" and 24" wheels.

Ask for Descriptive Circular
MUMMERT-DIXON CO.
120 Philadelphia St. • Hanover, Pa.

NOW!

Double Your Marking Production
at 1/2 the Operating Cost

The new Noblewest 4P1 all pneumatic marking machine is the finest general purpose machine in its price range. It is all pneumatic in operation. Easier, faster setup. New ease of operation. Permits women operators. Write for full specifications.



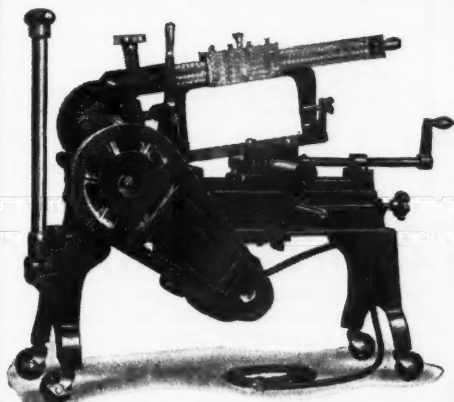
MARK IT BEST WITH

NOBLEWEST



The Noble & Westbrook Mfg. Co.
25 Westbrook St., E. Hartford 8, Conn.

SAWMASTER HACK SAW



LOW PRICED

**PORTABLE
SELF-CONTAINED**

Angle
Cutting
Vise

READY TO WORK

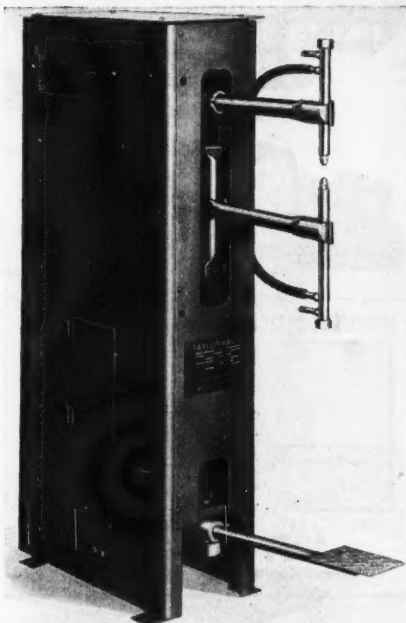
**STURDY
ECONOMICAL**

Write for Bulletin
No. 300

MILLER-KNUTH MFG. CO. OMAHA, NEB.

Taylor-Hall "True Pressure" Spot Welder

A press type spot welder featuring a "True Pressure" principle has been announced by the Taylor-Hall Welding Corp., Warren, Ohio. The machine is designed to apply welding pressure in a straight vertical movement of the upper electrode. The vertical ram on which the upper horn is mounted rides on V-shaped slides (20 inches long), designed for accurate alignment of electrodes and true pressure on every weld. The lower horn has a vertical adjustment of 6 inches



Taylor-Hall "True Pressure" Spot Welder

M-B MODEL M-CR
7500 R.P.M.



**"JUNIOR" Pneumatic
GRINDER**

This model has been engineered for applications where a small rugged tool can be used advantageously. Steel body for Safety. **Special grease-sealed bearings requiring no automatic or manual lubrication.** Compound rotors develop an abundance of power. Extremely lightweight, 12 oz. Whole length 5 1/8"; Length of body 3". Accommodates mounted grinding wheels, rotary files, etc., on 1/8" dia. shanks. Prompt deliveries.

REPRESENTATIVES IN PRINCIPAL CITIES

M-B PRODUCTS
130-134 E. LARNED ST.
DETROIT 26, MICHIGAN

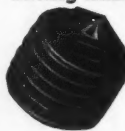
and swing adjustment through 90 deg. The upper horn may be adjusted 1 inch out beyond the end of the lower horn.

Occupying a floor space of 9 x 20 inches, the Taylor-Hall True Pressure Spot Welder includes an extremely narrow frame which allows for a wide variety of angular work. Available in capacities from 5 to 10 kva, the machine is equipped with a transformer which is said to require minimum input for maximum welding power.



A REAL HELPING HAND

It's a help that die makers, tool makers, machinery builders and general machinists have long sought—a more accurate and surprisingly faster way of transferring blind screw holes.



The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in 1/8" to 1" diameters. Send for price list.

HEIMANN MFG. CO.

330 Lincoln Ave.

Urbana, Ohio

**MICROMETER
STOP
COUNTERSINK**



Instant .001" adjustment #1900 Micrometer Stop limits depth of Co-sinks and Co-bores. Assures flushness. 1/4" Shank for drill press or hand drill. Cuts metals or plastics. Micrometer Stop \$7.25; HSS Cutters—7/16" dia. \$1.75, 9/16" dia. \$2.35. Specify incl. angle and pilot. Folder free.

AERO TOOL COMPANY
229 WEST OLIVE • BURBANK, CALIFORNIA

**Accurate Hole Transfer Made Easy With
NIELSEN TRANSFER SCREWS**



Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S. Inexpensive — Last for years. Write for Circular.

NIELSEN TOOL & DIE COMPANY
1960 W. Eleven Mile Rd.
Berkley, Mich.

**Square, Straight Tapping
in HALF THE TIME**



**42 50
F.O.B.
MINNEAPOLIS**

The Dahlstrom Tap Guide practically eliminates tap breakage, and turns out uniform work. Just fasten it to a post or bench, slip a Tap Adaptor into the spindle, and turn the handle. Equipped with 7 Adaptors from 8-32 to 1/2" (taps not furnished). Literature on request. Dahlstrom Mfg. Co., 418 S. Sixth St., Minneapolis 15, Minn.

Dahlstrom TAP GUIDE

Attention! SHOP FOREMEN

HALLowell

Here is a "Hallowell" Foreman's Desk of Steel—sturdy steel construction—with welded joints—that will take the headache out of keeping records, etc., in order. A dozen handy pigeon holes—plenty of writing space—tamper-proof—can be locked—this is a real addition to any shop.

For information regarding other "Hallowell" Shop Equipment of Steel, write for the "Hallowell" Catalog.

"Unbrako" and "Hallowell" products are sold entirely through distributors.

OVER 43 YEARS IN BUSINESS

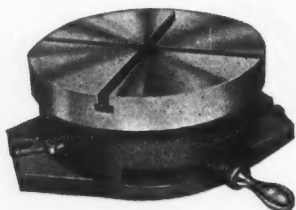
STANDARD PRESSED STEEL CO. **Fig. 2222**



JENKINTOWN, PA. BOX 356
Boston • Chicago • Detroit • Indianapolis • St. Louis • San Francisco

Troyke Cam Locking Type Rotary Table

The Troyke Mfg. Co., 4422 Appleton St., Cincinnati 9, Ohio, announces the addition to its line of rotary tables of a cam locking type table having no worm or



Troyke Cam Locking Type Rotary Table

wormwheel and designed for use in die-sinking and assembly operations. The platen revolves on two tracks and on a center stem in a tapered adjustable bushing.

The table can be clamped in any position by means of rise and fall cams which lock the platen to the base. An

easily accessible collar provides adjustment for wear so that the original position of the cam lever is maintained. Oiling facilities are carefully designed so that the tracks and the cams will work freely at all times.

The Troyke Cam Locking Type Rotary Table is available in three models designated as the FH-12, FH-15, and FH-18 and having turntable diameters of 12, 15, and 18 inches respectively.

Rotor Tool Types D-325 and D-125 Powerplus Grinders

The Rotor Tool Co., 17325 Euclid Ave., Cleveland, Ohio, announces two air grinders, the D-325 Powerplus for 8-inch wheels and the D-125 Powerplus for 6-inch wheels, suitable for work such as cleaning, grinding, or snagging castings of gray iron, malleable iron, steel, or non-ferrous metal; hogging out defects in large steel castings for welding and later for grinding the welds; removing fins, defects in billets, bar stock, and so on, in steel mills; grinding welds in structural steel fabrication; and polishing sheet metal work, particularly stainless steel.

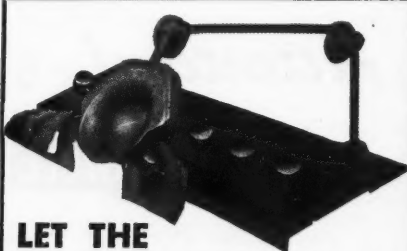
**IT
PUTS THE
SPOT-
LIGHT**

**on BETTER
and SAFER
WORK!**



Increases output and accuracy by putting continuous and ample illumination exactly where it is needed. **SAVES LIVES.** Prevents injuries to the eyes of workers or to their glasses.

The SPOT-LIGHT places the light on the left or right or directly over the face of the wheel to cover any grinding operation—an exclusive feature.



LET THE

"Sur-Site"

**MAGNIFYING UNIT SOLVE
YOUR INSPECTION PROBLEMS!**

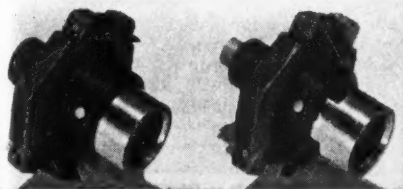
These magnifying units are of new and improved design, with underside lighting to make better and faster inspection. Ideal for inspection of metal parts, fabrics, or for locating foreign matter in bottled goods. Let us know your inspection problem and we will furnish you with the right magnifying unit to solve it.

SEND FOR CIRCULAR MM1

The Surty Mfg. Co., Inc.
4139 W. KINZIE ST. CHICAGO 24, ILLINOIS

The Surty Mfg. Co., Inc.
4139 W. KINZIE ST. CHICAGO 24, ILLINOIS

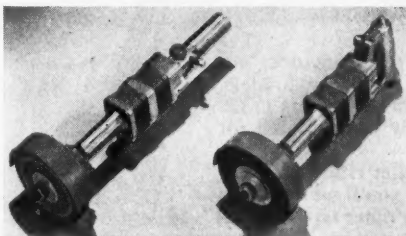
The outstanding feature claimed for each grinder is its lightweight, the D-325 weighing 11½ lb. and the D-125 weighing 9¾ lb. Of compact, simple construction



Rotor Tool Quick-Acting Governor M-801. (Left) Idling position, weights out, main port closed, 6,000 r.p.m. (Right) Full load position, weights in, main port fully open, 5,400 r.p.m.

and easy to service and maintain, each grinder includes a governor which idles the unit at the permissible free speed as determined by the Safety Code. As soon as pressure is applied to the work tending to reduce the speed, the governor opens quickly and positively to deliver full air at high load speed. According to the manufacturer, the governor enables the power of the external blade motor to be applied at high load speed which, in turn, results in high metal removal, reduced wheel costs, and easy operation.

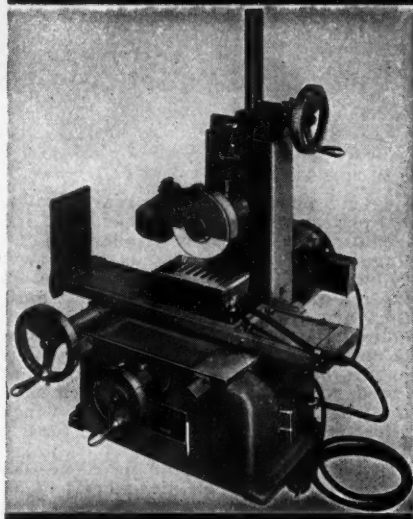
The lightweight of each tool is due to the extensive use of magnesium combined with a lightweight motor unit. Steel inserts are cast in the magnesium and machined to hold ball bearings. The main parts of both tools are interchangeable.



(Left) Rotor Tool Type D-125 Heavy Duty Powerplus Grinder with Straight Handle. Speeds, 6,000 r.p.m. for 6-inch elastic wheels, 4,100 r.p.m. for 3-inch elastic wheels or 6-inch vitrified wheels. Weight, 9¾ lb. (Right) Rotor Tool Type D-125 Heavy Duty Powerplus Grinder with Self-Closing Spade Handle. Speeds, 6,000 r.p.m. for 6-inch elastic wheels, 4,100 r.p.m. for 6-inch elastic wheels or 6-inch vitrified wheels. Weight, 9¾ lb.

February, 1947

SANFORD



HIGH SPEED BENCH SURFACE GRINDER

ACCURACY WITHIN .0001

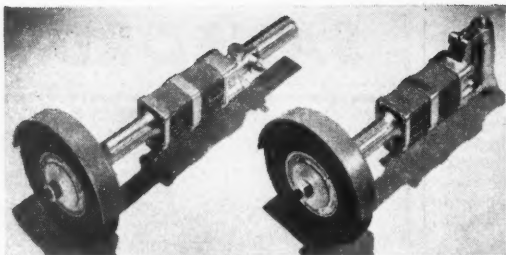
A sensitive, highly accurate,
machine specially designed

*"For The Job That
Fits in Your Palm"*

Write for Bulletin

SANFORD MFG. CO.
1020-28 COMMERCE AVE.
UNION • NEW JERSEY

MODERN MACHINE SHOP 289



Rotor Tool Type D-325 Powerplus Heavy Duty 8-inch Grinder. (Left) With Straight Handle. (Right) With Self-Closing Spade Handle

may be used at 6,000 r.p.m. for 4-inch vitreous wheels. In addition, both tools can be obtained in 13 and 27½-inch extension types.

ble, such as front handles, rear handles, end plates, and center sections.

Rotor Tool Powerplus Grinders are distinguished by twin red bands on the twin cylinders and by the Powerplus label on the red guard. Simple and compact mufflers are available where conditions require quiet operations. The D-325 can be obtained with a straight handle, spade handle, or safety handle for operation at speeds of 4,500 r.p.m. for 8 x 1-inch elastic wheels, 4,100 r.p.m. for 6 x 1-inch vitreous wheels, and 3,100 r.p.m. for 8 x 1-inch vitreous wheels.

The D-125 is available in speeds of 6,000 r.p.m. for 6-inch elastic wheels, 4,100 r.p.m. for 6-inch vitreous wheels, and

"Seal-Peel" Coating

A plastic packaging and protective coating for production packaging and toolrooms, to be known as "Seal-Peel," is now being marketed by Seal-Peel, Inc., 903 Hammond Bldg., Detroit 26, Mich. According to the manufacturer, the material can be easily applied to tools, gages, mechanical metal devices, specialized items, and so on, providing protection against rust and corrosion, condensation, chipping or scratching, moisture penetration, rough handling, tampering, and the elements. It is claimed to remain soft and pliable for years, never becoming brittle and can be easily removed by

TRY THIS

Easier

WAY OF ALIGNING

THE WORK WITH THE SPINDLE !

In setting up for tapping and reaming, you'll find that the work can be aligned with the spindle much more easily if you use a Ziegler Floating Holder.

This is because, with the Ziegler Holder, the work does not have to be aligned as accurately as with ordinary holders. Any inaccuracies, even though they amount to as much as 1/32" radius, or 1/16" diameter, are automatically compensated for by the holder.

Once you use a Ziegler Holder for tapping and reaming, you'll never again be satisfied with any other type of holder. Get one to try out on your next tapping or reaming job!

WRITE FOR CATALOG



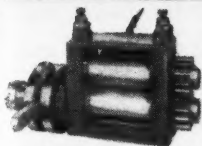
Ziegler
ROLLER
DRIVE

W. M. Ziegler Tool Co.

FLOATING HOLDER
for Taps and Reamers...

1924 TWELFTH ST.
DETROIT 16, MICH.

New GILBERT FRICTION ROLL FEED



Reverses with ONE Simple Operation! In Seconds!

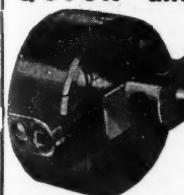
No slippage! Feeds up to 1000 stampings per minute! Made for easy adaptation of "roll lift" (*extra cost) for 5 to 150 ton presses.

THE ONLY ROLL FEED OF ITS TYPE ON THE MARKET

MACHINE SERVICE COMPANY

159 CROOM STREET • PROVIDENCE, R. I.

QUICK and ACCURATE



No. 35 FLYNN

MICROMETER
OFFSET
BORING HEAD
HAS RIGIDITY
PLUS A

Large Range
2" OFFSET

$\frac{3}{4}$ " bar or tool capacity.
Bores $\frac{1}{2}$ " to 12" dia. holes.
Write for catalog.

FLYNN MANUFACTURING CO.

437 Bates St.

Detroit, Mich.

WHEN YOU BREAK A TAP YOU NEED A

WALTON TAP EXTRACTOR



Prices range from \$1.50 to \$2.20 for the popular sizes.

The fastest, easiest, safest and most economical way to remove a broken tap from the work is with a WALTON TAP EXTRACTOR.

**No Mangled Threads—
No Scrapped Work—
No Frayed Nerves**

Write for Folder No. 10 and the 30-Day Free Trial Offer

THE WALTON COMPANY

94 Allyn Street

Hartford 3, Conn.

LET . . . DETROIT POWER SCREWDRIVERS PAY YOU PROFITS

IN TIME AND LABOR SAVED

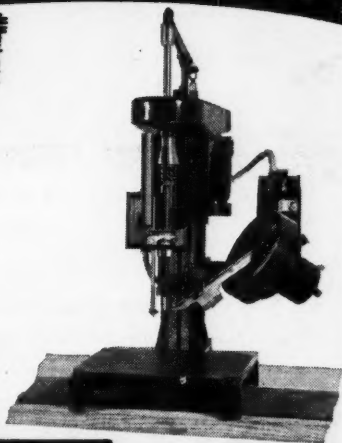
Yes, substantial profits through reduced costs and increased production. That's what you gain by using these popular, highly efficient machines—proven through years of constant use.

MODEL A PICTURED

Drives screws from No. 2 x $\frac{1}{8}$ to No. 6 x $\frac{3}{4}$.

A real production machine; drives screws at the rate of one second each. Will not mar screw heads or strip threads. TWO OTHER MODELS, driving screws from No. 6 to $\frac{3}{8}$.

Send Sample Assemblies for Estimates and Free Catalog.



DETROIT POWER SCREWDRIVER CO.

2807 West Fort Street,
Detroit 16, • Michigan.



Products to which Seal-Peel plastic has been applied

simply slitting the protective coating with the fingernail or with a sharp instrument.

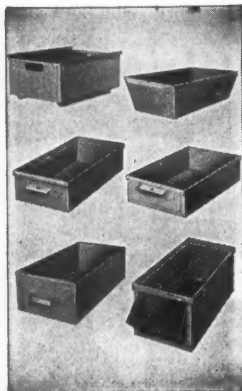
Seal-Peel is described as non-toxic, economical, safe, transparent, clean and easy to work with, free of obnoxious odors, and non-explosives. The thin transparent coating afforded by Seal-

Peel is said to withstand pressures up to 600 lb. per square inch and to be unaffected by temperatures ranging from 120 deg. below zero to 160 deg. above. Moreover, it is claimed to be non-conductive and impervious to salt spray and acids.

Supplied in small solid blocks, Seal-Peel is melted in electrically heated pots or vats and the materials to be coated are dipped by hand or mechanical means, depending upon the quantities involved. The plastic coating is said to dry instantly upon removal of the parts from the vats.

"Vulcanaire" Air-Powered Grinding Attachment

Known as the "Vulcanaire" a high speed air-powered grinding attachment which is said to quickly convert jig borers and other machine tools into precision jig grinders has been developed by the Vulcan Tool Co., 730 Lorain Ave., Dayton 10, Ohio. The attachment is equipped with an adaptor that is designed to fit into the chuck of any machine tool and has controllable speeds ranging from 30,000 to 75,000 r.p.m. From 4 to 8 cubic feet of air per minute is all that is said



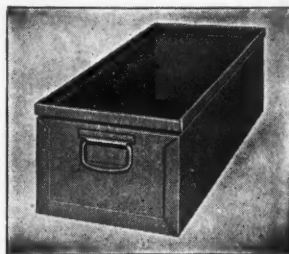
Top Rim STEEL STACKING BOXES

18" x 12" x 6". 16 Ga.
with Drop Handles

STANDARD SIZES

16 x 10 x 6 18 Ga.
16 x 10 x 6 16 Ga.
18 x 12 x 6 16 Ga.
18 x 12 x 8 16 Ga.

MADE IN OTHER SIZES



WE MANUFACTURE ALL TYPES OF STEEL BOXES

We make a specialty of boxes made to fit your particular handling requirements. Special boxes designed so they can be run thru with standards enable us to quote prices comparable with that of a standard box.

STERLING
FACTORY EQUIPMENT CO

183 CHARLES ST.
PROVIDENCE, R. I.

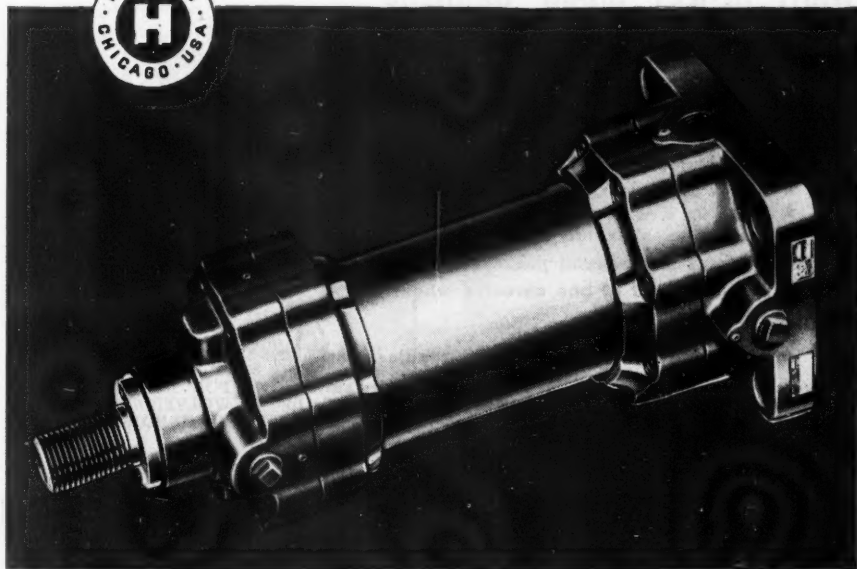
Something added to

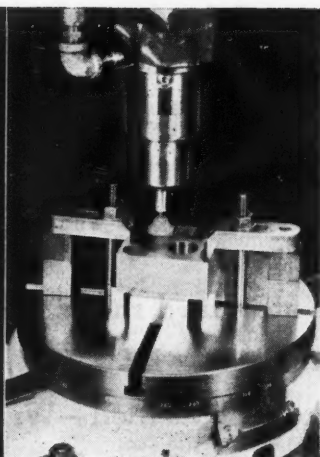
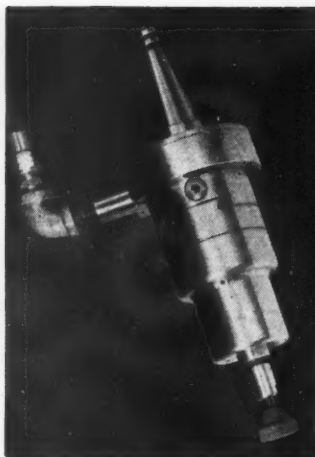
Hannifin Hydraulic Cylinders—

7 and 8 inch bores now standard

Nine standard mountings—1 to 8 inch bores—1000 lbs. service—stroke as specified—Write for information. Engineering service available in all industrial centers.

HANNIFIN MANUFACTURING COMPANY • CHICAGO 24





(Left) "Vulcanaire" Air-Powered Grinding Attachment for Machine Tools. (Right) "Vulcanaire" Grinding Attachment Applied to a Jig Boring Machine

to be required for the complete speed range.

The Vulcanaire Air-Powered Grinding Attachment has a maximum diameter of $2\frac{1}{2}$ inches and, exclusive of the adaptor

and oiler. In addition to jig grinding applications, the Vulcanaire is available in models for adapting lathes, milling machines, and internal and surface grinders for other high speed precision grinding.

WANT REALLY SHARP CORNERS ON THIN GRINDING WHEELS?

"Just Call On Me!"

Says The Metcalf Minute Man

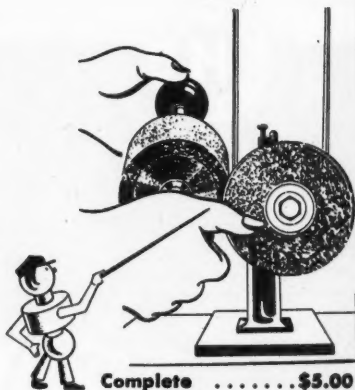
What The Metcalf Wheel Dresser Does:

- ★ Brings up sharp corners on thin wheels.
- ★ Trues up a square edge.
- ★ Turns a bevel rapidly and accurately.

Famous three-fold Metcalf principle:

- ★ Cutting effect of one abrasive wheel on another.
- ★ Hi-speed, gyroscopic action.
- ★ Steadying effect of heavy ball-handles.

Dresser-Wheel replacement costs little—means added savings and greater profits for you. Write today for full details in Bulletin M-27.



Complete\$5.00
Extra Wheels only. .75
FOR LARGE WHEELS
WOLVERINE DRESSER,
HAND MODEL.

* ELECTRIC BRAZERS
* ANVILS AND HAMMERS
* BAND WHEEL GRINDERS
* MISCELLANEOUS SAW &
* KNIFE FITTING EQUIPMENT

HANCHETT MANUFACTURING CO.
SAW AND KNIFE FITTING MACHINE DIVISION
BIG RAPIDS, MICHIGAN U.S.A.

* SAW SHARPENERS
* SAW STRETCHERS
* KNIFE GRINDERS
* SWAGES AND SHAPERS
* WELDING CLAMPS

"OLIVER" BELT SURFACING AND POLISHING MACHINE

for finishing surfaces of plates,
ornamental metal,
metal mouldings,
etc.



The three units—each self-contained—are adjustable to handle work of any practicable size. Rubber-faced, turned aluminum pulleys. Ball bearing, noiseless direct motor drive.

Write for Bulletin No. 183M

OLIVER MACHINERY COMPANY
Grand Rapids 2, Michigan

BRADFORD METALMASTER LATHES

14½" - 16½" - 18½" Swing

TOOLROOM AND ENGINE TYPES

... Also ...

CAM FEED

UNIT TYPE

DRILLING AND
TAPPING
MACHINES



The Bradford Machine Tool Co.

Evans at 8th St.

Cincinnati 4, Ohio

TURN On The HEAT

Quick Acting
Johnson
FURNACES

Harden ANY steels, dies, tools or small metal parts quickly and at low cost

**JOHNSON Hi-Speed
No. 120 Bench Furnace
\$120.50**

F.O.B. Factory

1500° F. in 5 Min.—2300° F. in 30 Min.

Use this powerful JOHNSON Hi-Speed No. 120 Bench Furnace for heat treating high speed steels . . . for hardening carbon steel tools and dies . . . for brazing carbide tipped tools. Reaches desired temperature FAST to save time and gas. Easily regulated. Firebox 5 x 7¼ x 13½. Ready for action, complete with Carbofrax Hearth, GE Motor, and Johnson Blower.

Order today.

There is a
Quick Acting
JOHNSON
Unit for
Every Tool-
room or Shop.
Write for
Literature.



JOHNSON GAS APPLIANCE CO.,
571 E Avenue N. W., Cedar Rapids, Iowa.

Please send Free Literature on Quick Acting Johnson Furnaces.

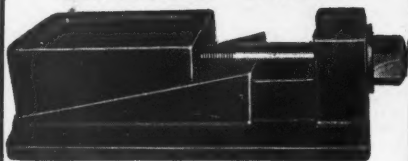
Name

Address

City..... State.....

Do you want accurate work from
your machines? . . . then use

LEVELING JACKS



Under the next heavy machines or
any equipment you will install or re-
arrange.

Leveling jacks are indispensable
and a real help to your reconversion
problems making re-arrangements
easy and fast.

We make them in three sizes which
cover the entire range of require-
ments.

Write for descriptive literature and prices.

Jurzek Machine & Engineering Co.

326 W. Lewiston Ave., Ferndale 20, Mich.

High Speed COUNTERBORES BACK SPOT FACERS



Interchangeable

Catalog
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Request

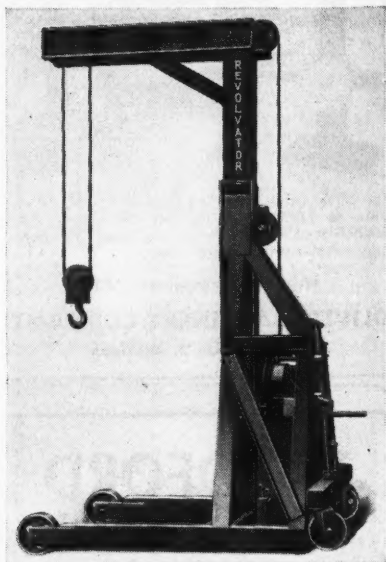
BICKNELL-THOMAS COMPANY

Greenfield

Massachusetts

Revolvator Folding Portable Crane

The accompanying illustration shows a
unique folding portable crane brought
out by the Revolvator Co., North Bergen,
N. J. The crane is so designed that the
upper part may be folded down to permit
moving the crane under low doorways or
other overhead obstructions. The folding
feature, which also facilitates shipping
in more compact form, is effected by the

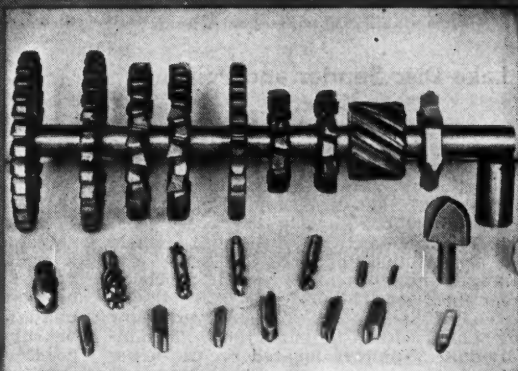
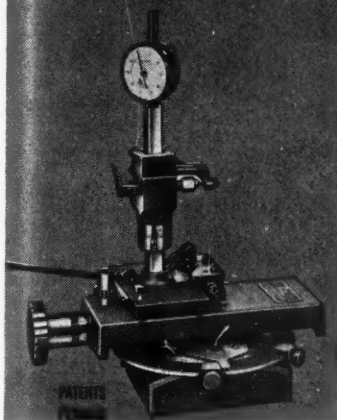


Revolvator Folding Portable Crane

same crank and cable that are used for
hoisting material. Thus, to place the
crane in an upright or extended position
ready for operation, the cable is simply
wound on the drum by means of the
crank until the pulley at the lifting hook
is against the frame. Continued winding
causes the crane to assume an upright
position where it can be locked in place
by inserting pins through the stationary
and movable frames.

To lower the crane, the hook is first
raised to the top, the interchangeable
crank handle placed on the brake shaft,
the locking pins removed, and the crane
lowered to a folded position by relieving
pressure on the brake drum through the
crank. The crane is equipped with a low
gear for lifting very heavy loads. The
crank handle is placed on the center

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Here are a few standard cutting tools that have been ground on the radiform into special forms.

If your production is being delayed in your tool room, it will pay you to investigate the **Rad** Wheel and Tool Former for simplifying your difficult tool grinding jobs. Radiform will save you time, money, and give you precision results you had never before hoped for.

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Manufacturers also of Meyco Carbide Drill Jig Bushings.

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shaft or lower shaft, depending upon the weight to be lifted.

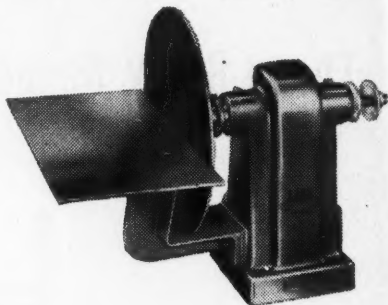
The Revolvator Folding Portable Crane, which has a maximum capacity of 4,000 lb., is recommended for use in machine shops, assembly rooms, stock-rooms, and other parts of industrial plants, as well as repair shops, warehouses, garages, and service stations. The crane is equipped with a floor lock and steering handle geared to the front wheels which turn easily on Timken roller bearings.

Lake Disc Sander and Polishing Head

A combination disc sander and polishing head for use in performing sanding, polishing, grinding, burring, and other operations is now being produced by the Lake Manufacturing and Engineering Co., 507 Industrial Bldg., Syracuse 4, N. Y. The hooded frame of the unit is made of cast aluminum and the arbor and flanged spindle collars are of precision machined steel.

The drive can be applied from below or behind with a $\frac{1}{2}$ -inch V-belt. Two individual V-pulleys located on the arbor

provide for a wide speed range and permit adjustment to eliminate end play in the shaft. The head is designed to drive



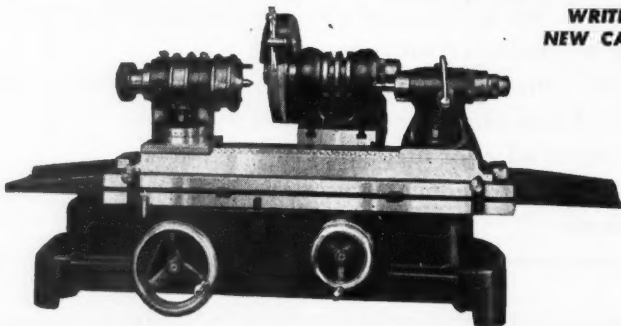
Lake Disc Sander and Polishing Head

a wide variety of accessories and is bossed on both sides to accommodate brackets and tables. Attachments are available for performing buffing, wire brushing, grinding, drilling, and various other operations.

Whether your work is small punches that have to be ground to a mirror finish to prevent breakage or a Sapphire Gage ground to less than One Micro Inch Surface Finish, it pays to have a

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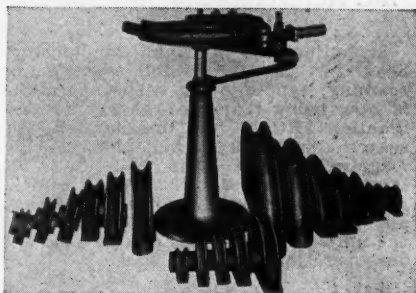
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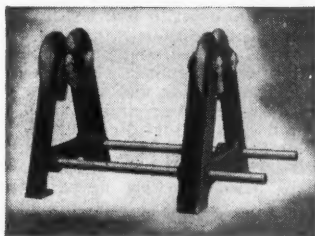
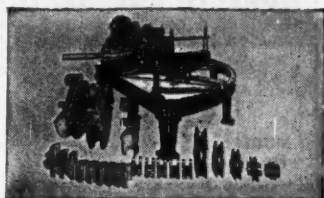
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Four chilled iron discs rotate with minimum friction on sensitive special bearings, giving a quick, accurate indication of whether or not the work is in perfect balance.

Write for Bulletin 2-22

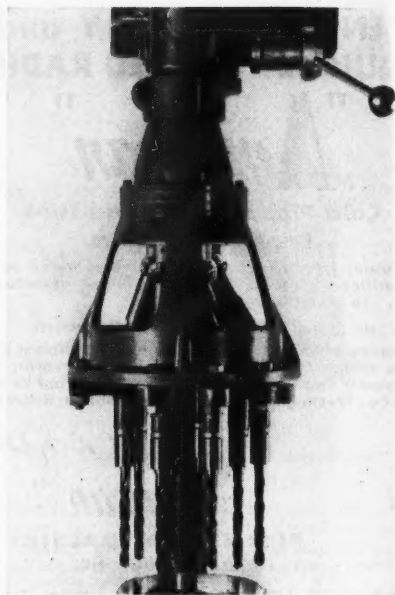
ANDERSON BROS. MFG. CO., ROCKFORD, ILL.

Swing	Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000



IRC Adjustable Multiple Spindle Work Head

An adjustable multiple spindle work head for use in drilling, spot-facing, reaming, tapping, and other operations is now being marketed under the designation IRC by the International Research Corp., 659 S. Anderson St., Los Angeles, 23, Calif. The head can be obtained with from 2 to 12 spindles, each of which is individually adjustable to suit any hole pattern within the capacity of the unit. Up to 8 holes can be drilled in one operation with the head.



IRC Adjustable Multiple Spindle Work Head

Special attachments are available for increasing the spindle capacity of the IRC Work Head to meet practically any production requirements. A newly designed accessory for use with the head is a speed increasing and reverse gear unit which can be installed between the spindle gearbox and the quill clamping bracket. This device is used on large type drill presses where spindle speeds are too slow for small drills. The reverse rotation afforded by the device enables the regular drill press feed mechanism to be utilized without alteration.

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February, 1947

MODERN MACHINE SHOP 301

Bremil All-Alloy Portable Hand Shear

Of all-alloy construction to ensure sufficient strength to withstand the additional strain of compound leverage, a portable hand shear is now being manu-



Bremil All-Alloy Portable Hand Shear

factured in two sizes to meet all portable requirements by the Bremil Manufacturing Co., 1211 Pittsburgh Ave., Erie, Pa. The No. 1 shear, which is intended for the artisan, is designed to cut up to No. 11 gauge metal without springing the jaws and weighs 22 lb. It is said to be an ideal portable tool on any shearing job away from the shop as well as on the workbench.

The No. 2 mill type shear is described as unusually strong at the pivot and,

regardless of the pressure exerted on the handle, it is claimed to operate continuously and safely without overstressing any of its parts. According to the manufacturer, the No. 2 shear, which weighs 28 lb., has been successfully employed on 1/4-inch thick 40 carbon stock.

The Bremil All-Alloy Portable Hand Shear is equipped with removable cutting blades made from high grade alloy steel which is properly heat treated, machined, and surface ground to assure accuracy and highest cutting efficiency. Due to the chemical analysis and the extreme toughness of stainless steels, specially treated blades are obtainable for maximum cutting results.

P&W Model C Roll Thread Comparator with Pressure Control

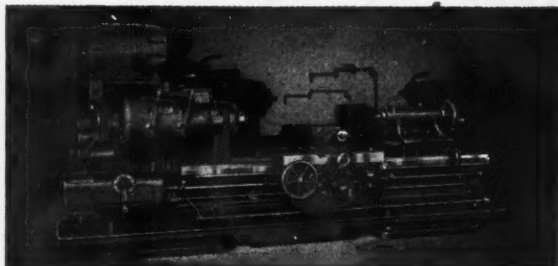
In order that small diameter hard-to-handle screws of fine pitch can be easily and accurately inspected, Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford, Conn., has developed a roll thread comparator with pressure control as illustrated herewith. Designated as the P & W Model C, the unit is recommended for use by fine instrument

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14" to 36"

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Minneapolis...The Satterlee Co.
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Newport News..Noland Co., Inc.
Philadelphia....Pratt & Whitney

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& Tool Co., Inc.
St. Louis.....Pratt & Whitney
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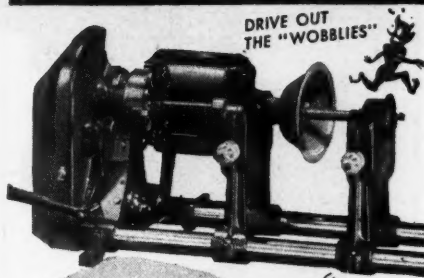
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BEAR
Model 340

Bear Dy-Namic balancing makes possible the elimination of the destructive "WOBBLES" of couple-force vibration. The performance, efficiency and life of the product are increased; the maintenance cost reduced. These advantages sell your product faster. This on-the-job-performance keeps it sold.

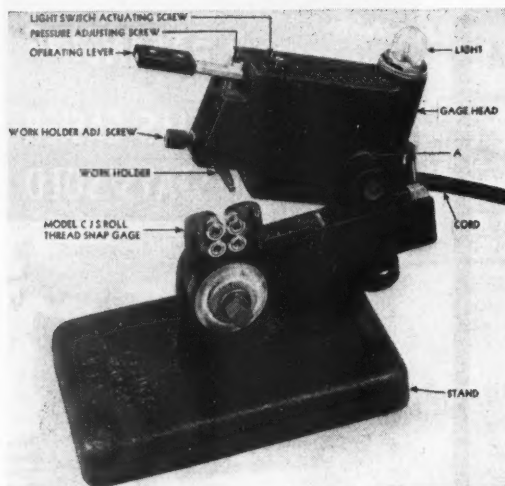
Simple in design, the "340" Bear Static and Dy-Namic Balancer is a low-cost machine. It Dy-Namically balances rotating parts accurately, easily and quickly.

In writing for the Free Data Bulletin on the "340," why not send us a sample part for our recommendations and analysis. Address Bear Mfg. Co., Dept. M-25, Rock Island, Illinois.



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COMBINATION

STATIC AND DY-NAMIC BALANCING MACHINES



P&W Model C Roll Thread Comparator with Pressure Control

The P & W Model C Comparator utilizes the J-S gaging principle with a pressure control feature which is said to relieve the operator of the responsibility of judging borderline cases. A signal light instantly shows the result of full "go" and "not go" functional check on pitch diameter, minor diameter, lead, and angle.

To check, the work is placed in the workholder where it is held on its major diameter. The operating lever is then depressed and the screw is presented to the gaging rolls. The light is always on except when excessive pressure is applied, at which time the light goes off, thus providing an accurate and sensitive pressure control. The gaging pressure is adjustable to suit the work.

manufacturing and related industries where thread inspection is necessary on screws of diameters ranging from 0.060 to 0.216 inch and threads of 80 to 28 per inch National Form 60-degrees.

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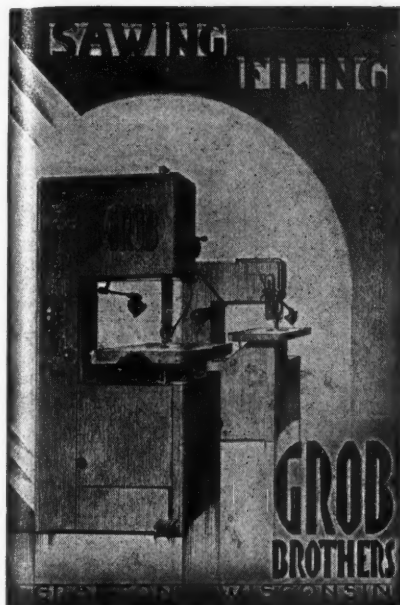
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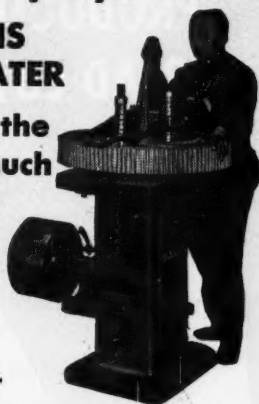


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All rotating parts move in anti-friction bearings. Other features include heavy construction, adjustable dials, all bearings of sealed construction and lubricated for life of machine, etc.

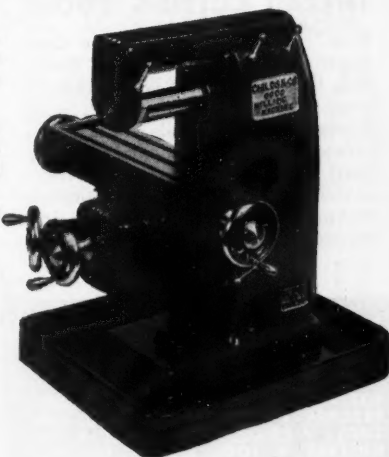
CAPACITY: Longitudinal feed 6", transverse feed 1½", vertical feed 4".

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For PRODUCTION THREAD CUTTING



STYLE TT for V-threading illustrated. STYLE TTS for V-threading to shoulder also available.

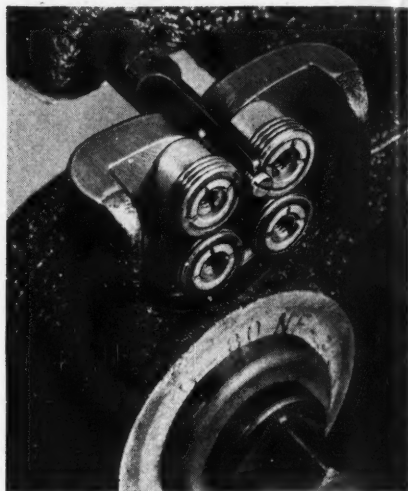
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Now! Thread cutting can be done faster, more economically. Available from stock in a wide range of sizes and grades. Use Wendt-Sonis Thread Cutting Tools to help increase production — combat rising costs. Get details. Write WENDT-SONIS COMPANY, Hannibal, Missouri or 580 North Prairie Avenue, Hawthorne, California.

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Correctly threaded screws pass the "go" rolls without resistance (light on), but will not pass through the "not go" rolls without resistance (light goes off). Oversize screws meet resistance at the



The Workholder Holds the Screw in Position for Gaging

"go" rolls (light goes off), while under-size screws pass through the "go" and "not go" rolls (light remains on).

Robbins Index Table

For fast, accurate indexing in a wide variety of production operations, the Robbins Engineering Co., 318 Midland Ave., Detroit 3, Mich., has brought out the Robbins Index Table shown in the accompanying illustration. The table is indexed manually and locked automatically.

To index, the crank handle is turned to horizontal, thus disengaging a large diameter locking pin. As the table is indexed, the handle is released and the table is locked in the next position automatically. The number and location of the index position are determined to suit the application. A safety stop permits indexing in one direction only.

The Robbins Index Table is firmly supported on a large, specially designed ball bearing which is said to eliminate out-of-parallel conditions due to vertical

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GWILLIAM JOURNAL ROLLER BEARINGS



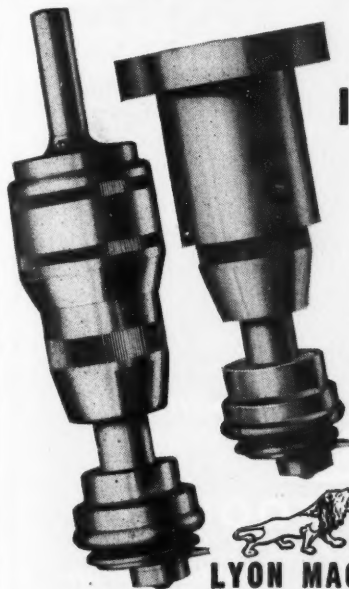
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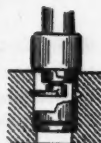
The Lyon INTERNAL GROOVING TOOL

Its versatility saves costly preparation time—provides precision grooving of single or multiple grooves at a production rate—plus economy of set-up time—and low initial cost. The LYON has been designed for making internal grooves to tolerances of .001" using any drill press, turret lathe, radial drill or automatic equipment.

By changing only bushings and cutters within the tool model range, you have at your command a wide variety of bore sizes and shapes. A simple adjustment regulates location and depth of groove. Work cannot be scratched or marred because the head of the tool does not turn when the cutter operates.

Our Engineering Department will welcome the opportunity of discussing any grooving problem without obligation.

LYON MACHINE CO., WORCESTER 3, MASS.

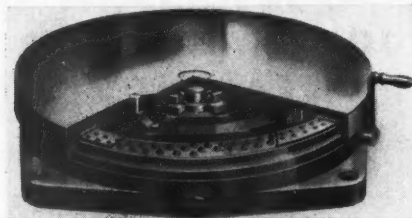


GROOVE
LOCATED FROM
BOTTOM OF
HOLE



SINGLE GROOVE
LOCATED FROM
TOP OF HOLE

thrust from cutting tools or heavy parts located off center on the table. The special design of the support bearing is



Robbins Index Table

also said to prevent Brinelling of the races.

According to the manufacturer, an anti-friction radial mounting provides for effortless indexing of the table and reduces operator fatigue to a minimum. All wearing parts of the unit are hardened and ground to assure long life and are concealed from dirt, chips, abrasives, and so on. The index table and base are ribbed for extra strength.

Aeroquip Hydraliscope

The Aeroquip Hydraliscope, a compact and portable high speed electronic analyzer which is said to provide consistent results even when used by persons unfamiliar with electronic devices, is announced by the Aeroquip Corp., Jackson, Mich. According to the manufacturer, controls and adjustment facilities are simple but sufficient to provide an indication and record of high speed pressure phenomena incident to the operation of hydraulic systems.

The Aeroquip pressure pick-up element used in connection with the Hydraliscope is of the resistance type. The Hydraliscope translates the output of the pressure pick-up to vertical deflections on a cathode-ray oscilloscope. Only two external connections are required—one to the pressure pick-up and one to any standard 105 to 125-volt, 50 to 1,800-cycle power service.

The Hydraliscope includes a direct coupled amplifier which is susceptible to low transient frequencies down to zero to permit the indication and recording of the absolute values of any transient. Output characteristics are flat up to frequencies of 20,000 c.p.s. Thus, the am-

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BEVERLY Throatless SHEAR

Cuts straight and irregular shapes faster—better! Order No. 1 for 14 ga. (with High Carbon, High Chrome Blades for 18 ga.); No. 2 for 10 ga. (with H.C.H.C. blades for 14 ga.); and No. 3 for $\frac{7}{8}$ " mild steel or 10 ga. stainless. Write for catalog!

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DORMAN TAPPER**

... instead of three ordinary tappers ... to tap No. 2-56 to $\frac{1}{8}$ " in steel or any other metal.

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1. No collets to get lost or need replacement.
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Write for further details.

**DO BETTER TAPPING AND
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MORE PARTS per hour
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the **BARKER WRENCHLESS CHUCK** can do it faster, better and stand up to it longer. Where the run is continuous on turrets, engine lathes, cutting off machines, drill presses or any other type of chucking machine, these Chucks will increase production and pay for themselves in 60 to 90 days while

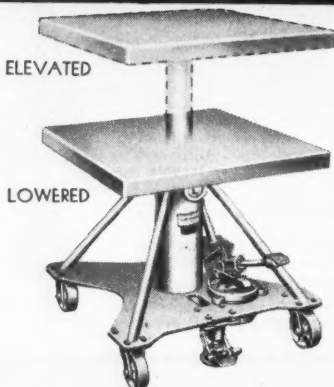
doing it. See how a Barker Wrenchless Two-Jaw or Three-Jaw Chuck can speed up production in **YOUR** plant.

Write for bulletin 201 today



—Chuck Division—
THOMAS HOIST CO.
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HERE ARE JUST 12 OF ITS USES:

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2. Sheet feeding
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4. Work table
5. Assembly bench
6. Positioning work to machine
7. Support for over-hanging work
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9. Transfer table
10. Positioning parts for attachment
11. Welding positioner
12. Loading and unloading



We have prepared an illustrated bulletin full of suggestions that methods engineers will find most helpful. It's free! Write for your copy today!

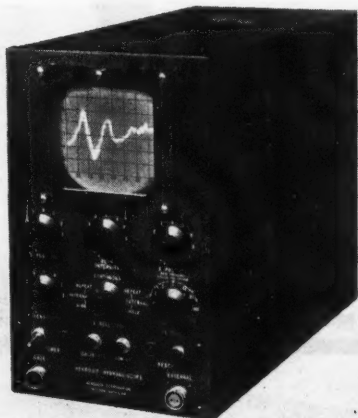
LYON-Raymond CORPORATION

561 Madison St.

Greene, N. Y.

plifier is said to be particularly suited to pressure phenomena which may vary from steady pressure to high frequency pulsations in the normal operation of regulating valves or controls and with the occurrences of shock pressures and surges. It permits the tracing and recording of pressure reference lines and also permits direct calibration with the aid of a dead weight gage tester or a test gage.

The Aeroquip Hydrauliscopes can be furnished with attachments to permit



Aeroquip Hydrauliscopes

photographic recording of the curves traced on the screen of the cathode-ray tube. Interchangeable guide plates may be inserted in front of the screen to provide direct calibration at standard scale factors such as 2,000 or 500 lb. per square inch.

Triometric System of Plant Layout

Designed to afford a scientific method of arranging and laying out production equipment to ensure maximum economies, fast production, increased safety, and reduced handling, a system of plant layout involving the use of cast metal scale models molded for permanency and accuracy is announced by the Triometric Engineering Co., 1170 Wolfendale St., Pittsburgh 12, Pennsylvania.

The scale models are so made that they are readily distinguishable as representative of the actual machines or equipment, as shown in the accompany-

BAUMBACH

THE DIE SET
AUTHORITY



All Baumbach Die-Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing Leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

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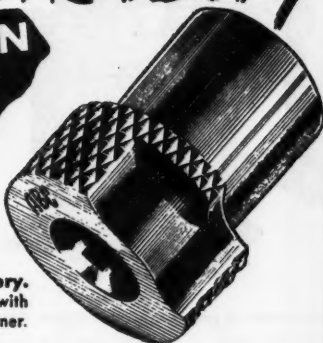
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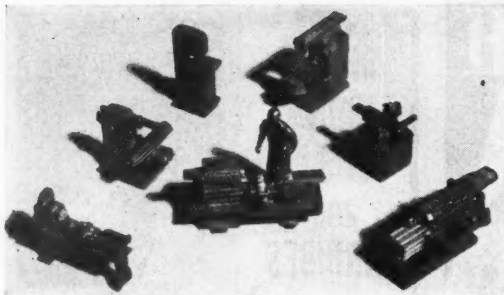
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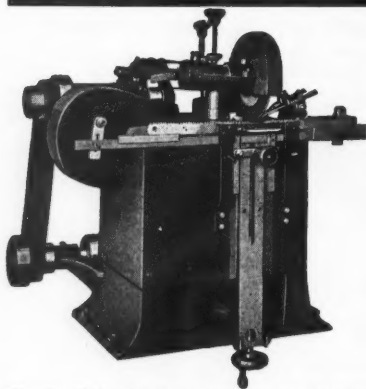
ing illustration. Scaled $\frac{1}{4}$ inch to the foot, models of standard or special machines as well as office equipment can be furnished. Two-dimensional templates are also available which show all clearances required under extreme operating and service conditions of the machine proper, as well as pertinent data required by the planning engineer.

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Designated as the Model FT-1, a precision-built three-way finger-tip valve featuring unusual ease of operation and adaptable for the actuation of cylinders up to 4-inch bore or more is announced by the Mead Specialties Co., 4120 N. Knox



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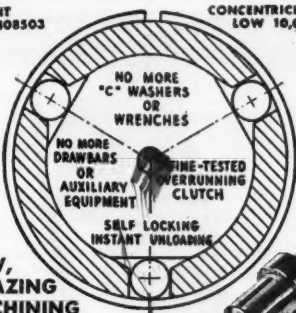
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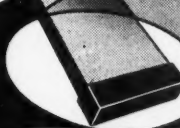
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H-6



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FLEXIBLE SHAFT EQUIPMENT

Ave., Chicago 41, Ill. The design includes parallel hose nipples leading from the rear of the valve and mounting holes by means of which it can be quickly attached to either vertical or horizontal surfaces. Moreover, the button of the valve is arranged in a low, convenient-operating position which enables the user's wrist to rest on a table if desired. (The travel of the button from full-closed to full-open position is approximately $\frac{1}{8}$ inch.)

According to the manufacturer, two Model FT-1 valves connected in series, as shown herewith, provide an ideal



This setup of two Mead Finger-Tip Valves, connected in series, illustrates the safety factor in air press operations.

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means for preventing accidents in the operation of air presses. In addition, as a result of its compact size and ease of attachment, the Model FT-1 valve is also said to be ideal for synchronizing with the action of a drill press, milling machine, and so on. By means of a simple cam, an automatic cycle can be set up for many types of work, thus minimizing the motions required of the operator, saving time, reducing fatigue, and increasing the safety factor.

The Mead Model FT-1 Finger-Tip

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ONE, FOUR and SIX spindle automatics maximum capacity 2 $\frac{5}{8}$ " round. Hand Screw Machines and Universal Turret Lathes maximum capacity 3" round. Castings and Forgings machined maximum 10" diameter, 8" length, 15 pound weight. Secondary operation equipment for milling, drilling, tapping and assembling. Fabricators of aluminum, brass, steel and their alloys.

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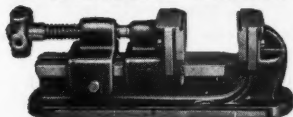
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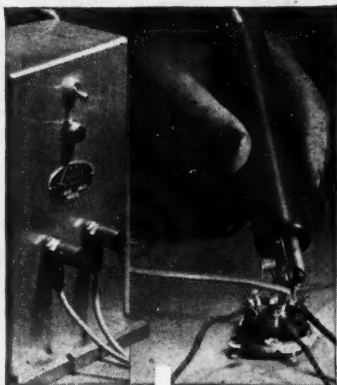
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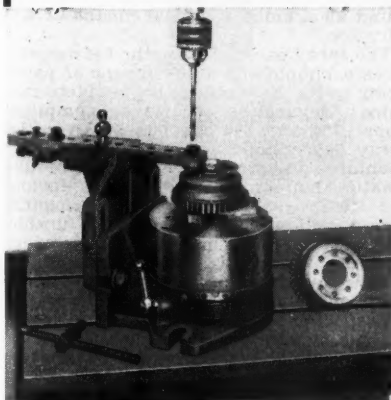
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- The Hartford Super-Spacer can be provided with the drilling attachment shown at the left which may be quickly secured to the base. Ample adjustment is provided to make an ideal combination for drilling odd lots of flanges, hubs or other parts where spaced holes on a circle are required. It can also be adapted for large lot production. It will save in cost of special jigs.

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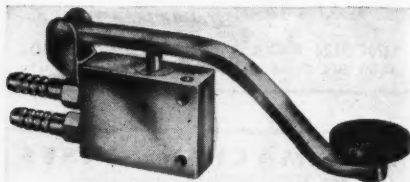
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Bonds are selected for their ability to hold diamond particles securely until completely consumed.

Straight cup, flaring cup, dish and other wheel types meet every production requirement for diamond wheels.

For all the facts, write for Bulletin 45A.

Valve, which is designed for $\frac{1}{4}$ -inch I. D. and $\frac{1}{2}$ or $\frac{3}{8}$ -inch O. D. hose, is of the normally closed type which actuates the cylinder when the button is pressed and exhausts it when the button is released. The valve can also be obtained in a Model FT-2 (for the same size hose as above) which is a normally open type that is designed to exhaust the cylinder



Mead Model FT-1 Finger-Tip Valve

when the button is pressed and actuate it when the button is released. For cam operation, the Model FC-1 and Model FC-2 are available, which are the same as the Model FT-1 and FT-2 respectively except that the lever and bracket are omitted.

"Cocoon" Packaging Plastic

A unique packaging plastic consisting of modified film-forming vinyl resins carried in volatile solvents, to be known as "Cocoon," has been developed by the Coatings Division, R. M. Hollingshead Corp., Camden, N. J. In performing the packaging process, the plastic is generally applied by the spray method, although for some types of work, dipping has been found as a more practical means of application.

The spray packaging method is described as a simple and quick means of packaging parts, assemblies, or complete machines, regardless of size or complications in shape. It consists of an initial spray operation which bridges large openings and voids with long weblike plastic filaments that completely enclose the item being packaged. Subsequent spray applications provide for a durable, tough, flexible moisture impervious package that is said to withstand exposure to wind, rain, snow, and sunlight over long periods.

Properties of Cocoon Packaging Plastic include moisture vapor transmission, the rate of which varies with the coating thickness; tensile strength of 1,750 to 2,000 p.s.i. (sprayed coatings); elongation



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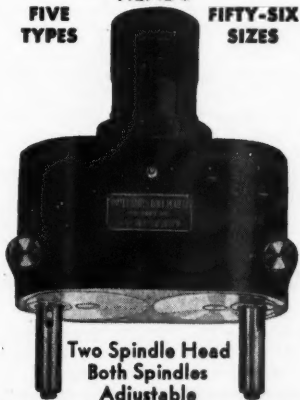


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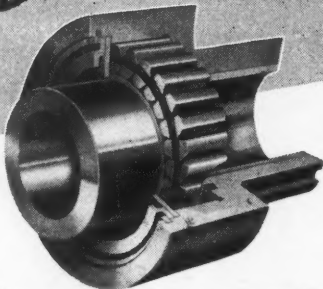
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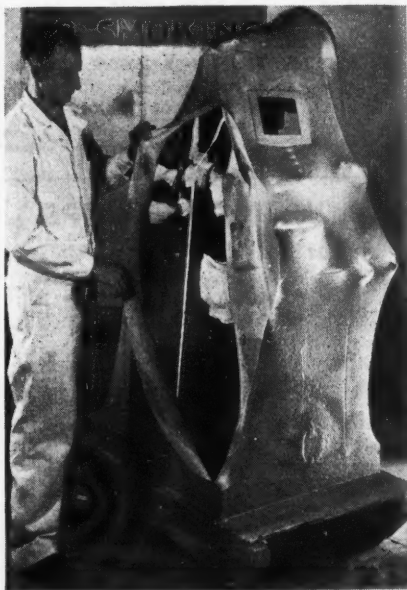
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mildew and mold; cohesion; adhesion; and durability. The material can be applied at temperatures ranging from 40 up to 120 deg. F. and has a coverage of approximately 2 gallons per 100 square feet for each 5 mills (0.005 inch) of coating thickness.

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The Mabor Co., Clark Township, Rahway, N. J., has produced a turn-table type washer which is designed to both rinse and dry average size parts in baskets, trays, or individually. The unit is said to require only one operator to load and unload the parts for cleaning. In addition, the washer, according to the

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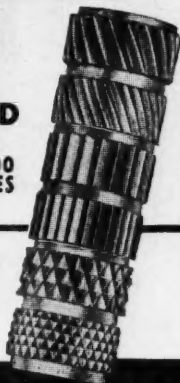


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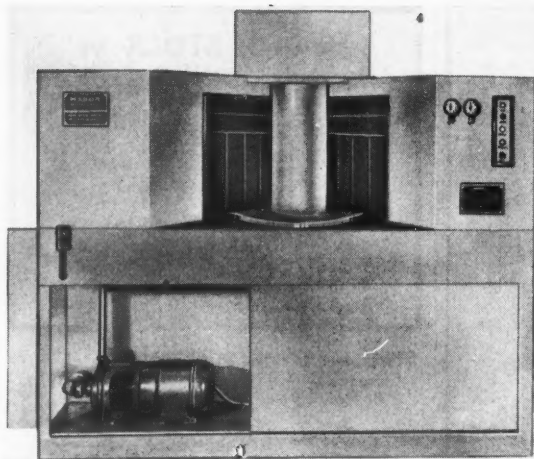
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Mabor Turn-Table Washing Machine

capacity is 1,800, 2,500, or 3,000 lb., according to the size of the machine.

The Mabor Turn-Table Washer is available in three standard sizes and may also be obtained with special modifications for difficult and unusual problems where centering of parts is essential. It may be heated by steam, gas, oil, or electricity.

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A precision-built drill jig

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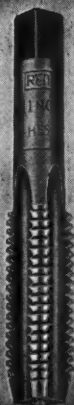
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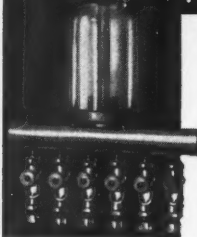
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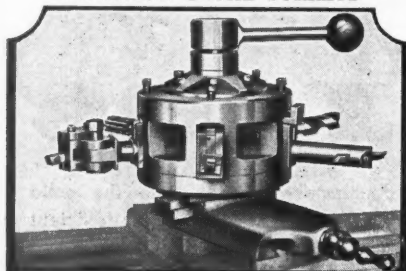
parent reservoir to prevent oil flow to the horizontal oil chamber when machines are not operating. Each drip fitting is equipped with an individual needle valve adjustment for regulating flow of oil, which can be locked against vibration. Ask for complete information on range of models and prices. Gits Catalog No. 60 illustrates and describes a full line of Oilers, Oil and Grease Seals and Lubricating Devices—write for your copy.

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to accommodate drills up to $\frac{1}{2}$ inch in diameter.

Measuring $4\frac{1}{2} \times 3 \times 1\frac{1}{2}$ inches in size, the McCullough Drill Jig is supplied complete with 6 bushings graduated from $\frac{1}{16}$ to $\frac{3}{8}$ inch inclusive. To drill $\frac{1}{2}$ -inch holes, the jig is used without bushings. An outstanding feature of the unit is a



McCullough Drill Jig

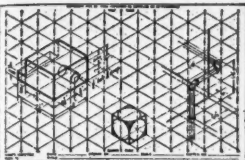
pivoted link and pin construction which is said to eliminate jaw springing or binding. Where production work is required, the jig is drilled and tapped for attaching to a table. For this purpose, two holes each are provided in the back, front, and base of the unit to permit mounting for any angle of work.

To use McCullough Drill Jig, the proper size bushing is simply inserted in the jig jaw and tightened in position by a locking screw. The part to be drilled is placed between the jaws, centering the part under the bushing guide hole, and clamped in position by tightening an actuating screw at the top of the jig upright. When off-center drilling is required, gage blocks are placed between the part to be drilled and the jig upright. This arrangement also allows for drilling within $\frac{1}{8}$ inch of a shoulder.

The McCullough Drill Jig is case hardened and ground all over to withstand severe usage and is furnished in a rustproof metal box including 6 bushings and 2 locking wrenches.

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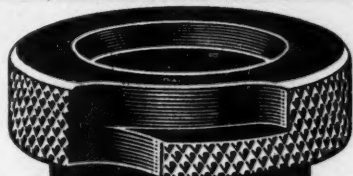
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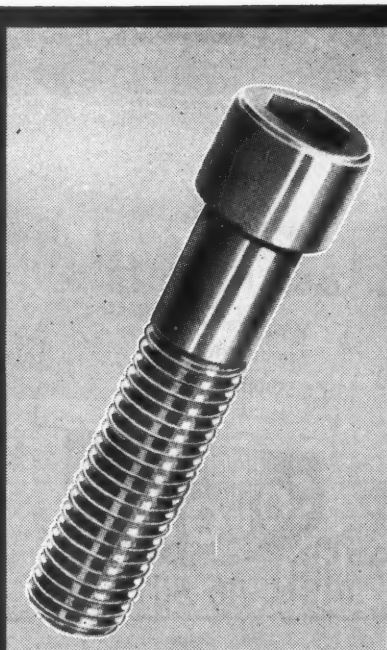
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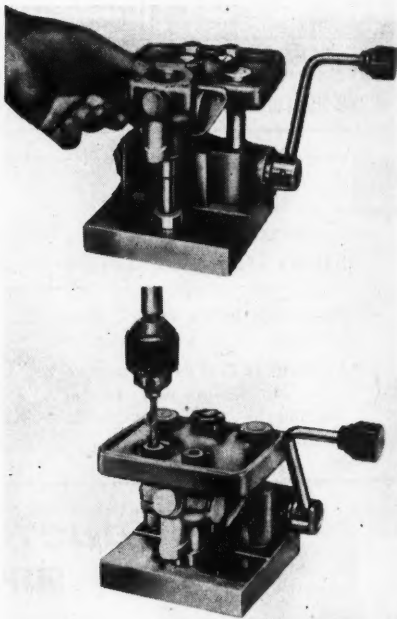
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Lift-Swing Drill Jig Vise

A drill jig vise for use in holding pieces to be drilled, chamfered, tapped, or counterbored has been placed on the market by the Lift-Swing Fixture Corp., 237 South Ave., Garwood, N. J. The top plate of the fixture can be swung 180 deg.



Lift-Swing Drill Jig Vise

so as to permit the work to be inserted, and then swung back into the proper working position and locked in place by means of a simple crank-type locking handle.

The Lift-Swing Drill Jig Vise can be obtained with extra top plates which are interchangeable and can be quickly installed.

Gilbert Friction Roll Feed

A friction roll feed for use in the jewelry industry or in any manufacturing plant where it is necessary to feed stock into a stamping or cutting machine has been placed on the market under the trade name of Gilbert by the Machine Service Co., 159 Croom St., Providence,



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from end to end—side to side—inside and out. POBCO SELF-LUBRICATING BEARINGS are machined to micrometer exactness.

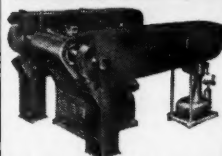
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OF KALAMAZOO

BACKSTANDS

CONVERT
GRINDERS-POLISHERS
into high production
ABRASIVE BELT UNITS



No. 3
Back-stand

Hammond Variable Speed
Polishing Lathe and No. 3
Backstand installation.

Hammond Machinery Builders

1614 Douglas Ave. • Kalamazoo 54, Mich.

At Last!

THE AUTOMATIC ANGLE TANGENT TO RADIUS DRESSER



Patent No.
2,302,712
Other Patents
Pending

MODEL
P-1

That Eliminates the Breaks in the
Profile at the Points of Tangency.

NO TEMPLATES! NO ROLLS REQUIRED!
Three Simple Adjustments and
It's Set-Up.

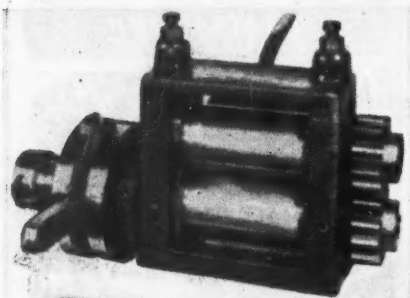
The Jeon Dresser will dress a radius
(within .0001") either concave or con-
vex, with angles absolutely tangent
(to a split second) on either or both
sides of the arc, IN ONE CONTINU-
OUS OPERATION. Also, any com-
bination of angles or angles and arcs.

Write for Prices and Folder Describing
Its 20 Outstanding Features
Manufacturers' Representatives Wanted

JEON MANUFACTURING COMPANY

Post Office Box 6750
Washington 20, D. C.

R. I. An outstanding feature of the feed is the ease and speed with which it can be reversed. According to the manufac-



Gilbert Friction Roll Feed

turer, the feed can be reversed in less than a minute by even an unskilled operator without removing any parts.

Additional advantages claimed for the Gilbert Friction Roll Feed include the reduction of slippage to a negligible minimum. In addition, the feed, it is stated, is unaffected by oil or grease and can be

held to tolerances as close as 1/3000 inch under all conditions, thus making it satisfactory for use in precision operations. Stock can be easily inserted into the rollers due to an automatic release which relieves pressure and prevents pulling.

"Mulsirex"

"Mulsirex," an emulsifying agent designed for use with kerosene and other petroleum cleaning agents, is now being introduced by Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1, Calif. The product is recommended for removing very heavy deposits of oil and light grease from all kinds of metal parts and equipment.

In solution with petroleum cleaning agents, Mulsirex, according to the manufacturer, adds to the cleaning potency of these agents through its deep penetrating qualities. The emulsifying characteristics of the product are said to make foreign substances readily soluble in water, a feature that permits the deposits to be flushed away after application of the cleaning agent with a simple cold water rinse.

Since it can be used in dilutions as high as 1 to 10 with solvents, the manufacturer points out that Mulsirex is unusually economical to use. It can be quickly and easily applied with a spray, brush, or mop, or as a cold tank immersion solution, and is claimed to be absolutely harmless to metals.

GAMMONS

REAMERS

Manufacturers of

- The Gammons Helical Taper Pin Reamer
- The Gammons Helical Chucking Reamer
- The Gammons Helical Die Making Reamer
- The Gammons Duplex Taper Pin Reamer

Special reaming problems invited
Send for Catalog

THE GAMMONS-HOAGLUND CO.
MANCHESTER

CONNECTICUT

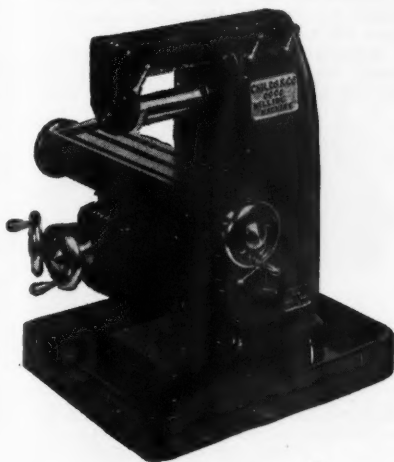
Childs Model No. 0000 Knee Type Milling Machine

Childs & Co., 200 16th St., Conneaut, Ohio, is now manufacturing a small knee type milling machine designed for use by manufacturers of small parts, tool and die shops, instrument makers and laboratories, experimental shops, vocational schools, watchmakers, gunsmiths, fabricators of electrical and electronic devices, and so on. Designated as the Model No. 0000, the unit is sturdily constructed and has a longitudinal feed of 6 inches, transverse feed of 1½ inches, and vertical feed of 4 inches. Movement of the table in transverse, longitudinal and vertical directions is said to be held to an accuracy of 0.001 inch, and the runout of the spindle to a tolerance of 0.0001 inch.

The 14½-inch high basic unit may be used on a bench or table or, if specified, can be supplied with a pedestal base, thus providing a floor-type milling machine. In either instance, the double V-belt ex-

tends up through the column. A countershaft and jackshaft with V-belt pulleys provide for nine speed changes. The countershaft assembly, which is available in the pedestal base, affords speeds of from 280 to 11,150 rev. per minute.

The ground alloy steel spindle, which has a No. 5 B&S taper, is driven by V-



Childs Model No. 0000 Knee Type Milling Machine

belts from the countershaft. The over-arm is a solid rectangular type sliding in scraped dovetail ways and is clamped in place by two locking levers. The arbor support can be equipped with either a bronze or Torrington needle bearing, oiled from a cup in the support. The four adjustable dials provided on the machine are equipped with knurled locking screws and have 100 graduations, each graduation being 0.001 inch. All feed screws have Acme form threads.

The Childs Model No. 0000 Knee Type Miller is generally recommended for use with a $\frac{1}{2}$ h.p. motor, however, if only light cuts are to be made, a $\frac{1}{3}$ or $\frac{1}{4}$ h.p. motor may be used. The $14\frac{1}{2}$ -inch high basic bench unit weighs 75 pounds.

Madison Rough Boring Tool

Readily adaptable to both production and jobbing shop operations, a rough boring tool of block type design is now being manufactured by the Madison

3 NEW *Featherweight* **KIPP AIR GRINDERS**

MODEL JA

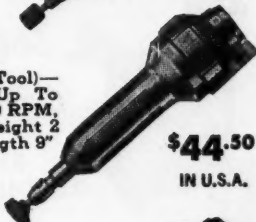
(Turbine Type Tool)—
Takes Wheels Up To
 $\frac{1}{4}$ " Speed 30000 RPM,
Collet $\frac{1}{8}$ " Weight 12 oz.
Overall Length $6\frac{1}{4}$ "



\$33.25
IN U.S.A.

MODEL TT

(Turbine Type Tool)—
Takes Wheels Up To
 $1\frac{1}{4}$ " Speed 30000 RPM,
Collet $15/64$ " Weight 2
lbs., Overall Length 9"



\$44.50
IN U.S.A.

MODEL PVT

(Vane Type Tool) — A
Power Tool For The
Heavier Jobs Taking
Wheels Up To $2\frac{1}{2}$ "
Speed 10000 RPM, Collet
 $15/64$ " Weight 2 lbs. 4
oz., Overall Length 9"

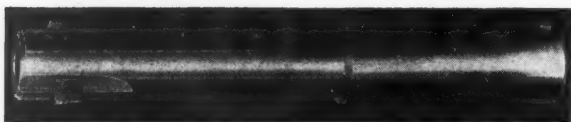


\$55.50
IN U.S.A.

Order Now!

You now have your choice of three Featherweight Kipp Air Grinders as illustrated above. All three are available for immediate delivery and priced extremely low. Madison-Kipp carries a full line of Kipp grinder wheels and accessories. Order today.

**MADISON-KIPP
CORPORATION**
208 Waubesa St., Madison 4, Wis.



Madison Rough Boring Tool
Inserted in Bar

Manufacturing Co., Spring and Bauer Sts., Muskegon, Mich. Advantages provided by the tool include quick changing of cutters, adjustment of cutter size for mounting in bar, and positive centering of cutter in bar. A single micrometer screw expands both blades of the tool

equally from the centering slot on the blades themselves. Only a screw driver is said to be required in order to expand the cutter to compensate for wear and regrinding.

According to the manufacturer, as much as $1\frac{1}{4}$ inches of stock can be removed at a very heavy feed with the

MOGUL
DOT WELDING
*Reclaim
Defective
Castings*
**REDUCE
RESIDUAL STRESS**

Eliminates heat distortion and makes possible the repair of defective castings, both ferrous and non-ferrous, with a fast, readily machineable, fill-in deposit of aluminum, nickel, copper, bronze or zinc. Ideal for press fit work, parts repair, etc. No foundry, machine, or pattern shop can afford to be without a Mogul Dot Welder.

Write for Bulletin D-1-A

METALLIZING COMPANY OF AMERICA
Dept. M5, 1330 W. Congress St., Chicago 7



Madison Rough Boring Tool

Madison Rough Boring Tool due to the simplified cutter assembly, which eliminates mechanisms of any kind and provides for unusual strength.

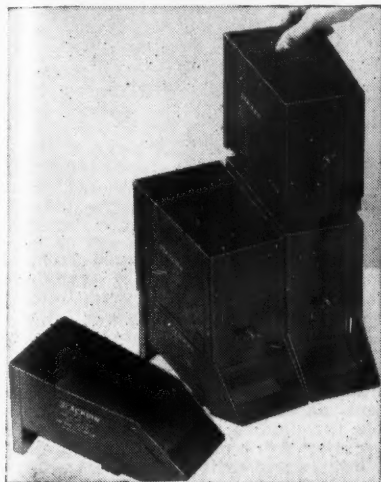
Stackbin Adjustable Hopper

Regulating the flow of small parts in assembly bins is now possible by means of a sliding-front hopper announced by the Stackbin Corp., Providence, R. I. The hopper is said to prevent the overflowing or jamming of parts, thus saving time and speeding operations.

According to the manufacturer, the Stackbin Adjustable Hopper not only

LUERS
PATENTED CUTTING OFF TOOL HOLDERS
PATENTED CUTTING OFF BLADES
ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY
Manufactured by
J. MILTON LUERS, 12 Pine Street, Mt. Clemens, Mich.
Produced under License Issued by John Milton Luers Patents Inc

provides increased capacity for parts but also affords a regulated flow of parts according to size and weight. Its opening can be made small or large according to the circumstances. When two hoppers are used, one on top of the other, the increased weight of parts, which tends to force out too many units, can be offset by regulating the size of the opening. All adjustments can be easily and quickly



Stackbin Adjustable Hopper for Assembly Bins

made. The slide is held in position by a wing nut for convenient adjustment.

The Stackbin Adjustable Hopper is made of heavy gauge sheet steel with welded construction throughout. Attached to a bin without the use of nuts and bolts, the hopper is claimed to remain absolutely rigid.

Almco Jet-Type Collet Chuck

A jet-type collet chuck for use on hand screw machines and engine lathes up to 1-inch capacity, to be known as the Almco, is announced by the Modern Collet and Machine Co., 401 Salliotte St., Ecorse 18, Mich. The gripping pressure of the collet is adjustable in 12 positive steps from zero to 15,000 lb. In this manner, thin-walled tubing can be held without distortion, while bar stock can be firmly gripped for taking hogging cuts up to the full horsepower of the machine.

TAPPING TIPS

From Woody Spencer's Notebook

NO TAP CAN BE A ONE-MAN BAND!



A lot of tapping troubles bob up when fellows forget that taps are made for special purposes. You can't expect the tap to do everything. For instance, a tap that's ground with a rake for steel falls down flat when it's tried in brass or cast iron. Plastics, too, have brought a lot of new tapping requirements. Best way is to make sure first that the tap is ground for the material at hand. Ordinarily taps designed for steel are not marked. But we try to make it easy for our customers. When requested, taps for other materials are marked on the shank. And we don't charge anything extra either. On your next order, have us mark your taps with material designations. Bet you'll find it helps out a lot with your tapping.



These Tapping Tips of Woody Spencer's aren't intended as technical aids in solving tapping problems. They're just hints and short cuts Woody has gathered in his rounds among the shops and wants to pass on for whatever they're worth in making tapping jobs run a little quicker and easier.

Put the technical questions up to the engineers. If you're having some trouble, send us the complete details of the job—material, diameter, depth, lubricant, through or blind hole, etc. Our engineers will be glad to offer specific recommendations. No obligations, of course.

NOTE: Woody Spencer's Tapping Tips will appear here as regularly as Woody gets time to write them up. Look for them. Our complete, new catalog just off the press. Send your request on Company stationery.

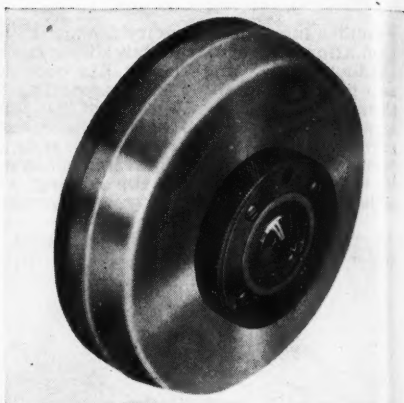
THE RIGHT TAP AT THE RIGHT TIME.

The Wood & Spencer Company
Cleveland 3, Ohio



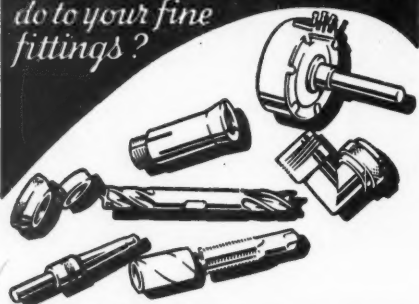
The collet is closed by spring action with a positive, uniform force and is opened by a compressed air jet (100 p.s.i. line pressure). This design is claimed to eliminate all danger of the chuck opening in case of falling air pressure. There is no contact between the air nozzle and the chuck and thus no wear; and the chuck can be opened in any position if stationary, or at any speed up to the maximum speed of the fastest machines.

According to the manufacturer, the collet is positively positioned in the chuck and cannot loosen or change adjustment with rotation in either direction. Collets



Almco Jet-Type Collet Chuck

What will dust and moisture do to your fine fittings?



PRECISION DUST CAPS AND THREAD PROTECTORS

Perfectly safeguard exposed ends, coils, forms, etc., in transit or storage. Strong, spirally wound fibre, formed to seal *any shape*, inside or outside. Write for samples.

PRECISION

PAPER TUBE CO.

2051 W. Charleston St.,
Chicago 47, Ill.



can be quickly interchanged from the front of the chuck and are available in all sizes up to 1 inch maximum in round, hexagon, or square designs.

The Almco Jet-Type Collet Chuck has an overall length, including collet, of 2 3/4 inches and weighs 11 1/2 lb. Chucks of larger sizes are in the process of development, as well as indexing bases to enable the chucks to be used for second-operation work on other machines such as millers and drill presses.

Airco Molten Steel Flushing Process

The specimen on the left in the accompanying illustration shows the resultant pockets of porosity that may develop when dissolved hydrogen is not permitted to escape from steel while it is being cast. Such pockets can easily ruin

THE KOCH TEST INDICATOR

— 2 WORKING ENDS

Better visibility and greater accuracy.

The only toolmakers' Indicator on the market with two working ends. One end to test outside surfaces, the other inside.

The Koch Test Indicator is constructed so that the plunger moves away from, instead of against the lever, preventing the delicate parts from being broken by a sudden or excessive jolt of the plungers. Each graduation on the scale represents 1/1000 of an inch movement of the plunger. Send for bulletin. Price of Indicator \$6.50.

ANDREW GENALES

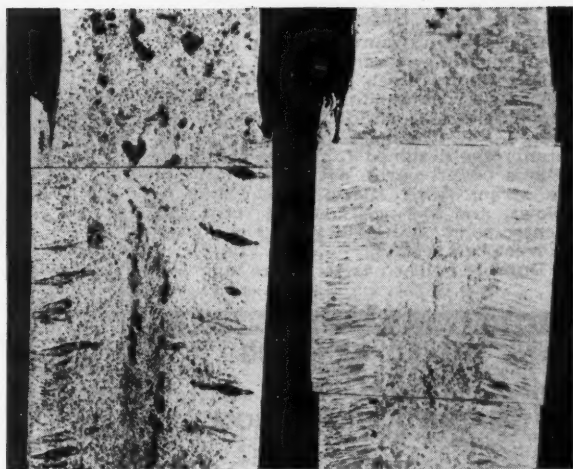
Phone Nyack 2222

28 2nd Ave., Nyack, N. Y.



*What Every Tool Room,
Toolmaker, Machinist Needs*

(Left) Specimen in which dissolved hydrogen was not allowed to escape while casting. (Right) Specimen which was subjected to Airco Flushing Process in casting.



an entire heat of steel. The application of a flushing process developed by Air Reduction Sales Company engineers, by which dry nitrogen or argon is bubbled through the metal is said to eliminate the dissolved hydrogen efficiently and economically. The specimen on the right clearly shows the results obtainable when the flushing process is used.

The only equipment required in utilizing the Airco Flushing Process is a supply of dry nitrogen or argon and a special tube with which to introduce the gas in the form of small bubbles. It is anti-

cipated that the process will find wide use in foundries to minimize casting rejects caused by porosity. Complete information on the process is available from the Air Reduction Sales Co., 60 E. 42nd St., New York 17, New York.

New TOOLMAKER'S *Positive-Lock* SURFACE GAUGE

WILL NOT SLIP

The Drawbolt has a positive lock and you can be sure there will be no slippage of the gauge or scriber when set.

Specifications:

1. Spindle 9" x 5/16".
2. Block 3 1/4 x 2 1/2 x 1" with 90° angle groove in base to fit similar or curved surface.
3. Surface of gauge precision Ground.

\$6.00

Write for circular.

Manufactured by the
Koch Test Indicator

ANDREW GENALES

28 Second Ave., Nyack, N. Y.
Tel. Nyack 2222



"Nu-Grip" Safety Steel Stamp

Featuring a countersunk hole on all four sides, a stamping tool made of Mecco Safety Steel, to be known as the "Nu-Grip," is announced by the M. E. Cunningham Co., 158 E. Carson St., Pittsburgh, Pa. The holes on the sides of the stamp are designed to assure the operator a positive grip, even when the tool is struck with the severest hammer blows, and are positioned at the exact center point of the stamp to provide for correct balance.

Durably built so as to assure long ser-



"Nu-Grip" Safety Steel Stamp

vice life, the Nu-Grip Safety Steel Stamp is available in standard sizes from $\frac{1}{4}$ up to and including 1 inch. Characters are engraved on standard heavy duty blanks and are therefore adaptable for all kinds of stamping applications, including the marking of tough alloy steels.

SEND US YOUR PRINTS FOR *Quotations*

**THREAD GRINDING
BROACHING
MAGNETIC INSPECTION**

TAYLOR
MACHINE COMPANY
MANUFACTURERS OF
AVIATION & AUTOMOTIVE PARTS
Gear Specialists
1000 EAST 9TH ST. CLEVELAND 3, OHIO

GUN DRILLS

for Deep-Hole Drilling

**WITH H. S. S. OR CARBOLOY
TIPS. INQUIRIES SHOULD
STATE DIAMETER, OVER-ALL
LENGTH, SIZE AND STYLE OF
ADAPTOR.**

CONNER

TOOL & CUTTER COMPANY

1000 East McNichols Road, Detroit 3, Mich.

Porterfield "Milpal" Machine Vise

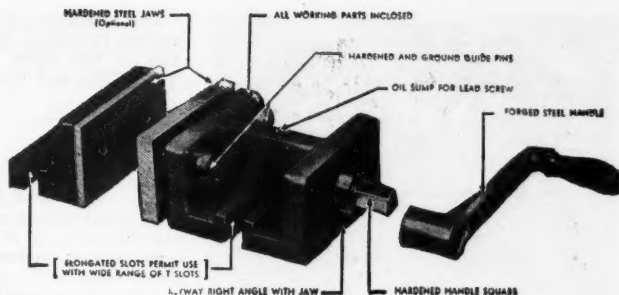
Utilizing 90 per cent of the longitudinal capacity of the flat table surface of any machine with T-slots, the Porterfield "Milpal" Machine Vise now being manufactured by the Porterfield Manufacturing Co., 749 E. 15th St., Los Angeles 21, Calif., can be adjusted to hold work



**PRESSES
FEEDS
AUTOMATIC
EQUIPMENT**

The V & O Press Company, Incorporated
HUDSON, NEW YORK

Porterfield "Milpal" Machine Vise



from zero to the maximum capacity of the table. The construction of the vise consists of heavy semi-steel castings, heavy ribbing, steel jaws, heavy 1-inch, 6-thread steel lead screw and bronze nut, both operating in oil. Accurate alignment is said to be assured by a keyway provided in the base of the vise and riding in a T-slot in the flat table of the machine. Jaws are operated manually by screw adjustment.

The Porterfield Milpal Machine Vise is available in 5, 7, and 9-inch jaw widths, the 5-inch fitting T-slots from 3 to 4 $\frac{1}{4}$ inches between centers and the 7-inch size fitting T-slots from 4 $\frac{1}{4}$ to 6 $\frac{1}{4}$ inches between centers, while the 9-inch size fits T-slots from 6 to 8 $\frac{1}{4}$ inches between centers.

Leiman Motor-Driven Vacuum Priming Unit

A motor-driven vacuum priming unit for water pumps is now being manufactured by Leiman Bros., Inc., 134-83 Christie St., Newark 5, N. J. The unit may be attached to an electric control switch for maintaining the required degree of vacuum in the reservoir tank, and includes a vacuum relief valve which, being set to several degrees higher than the required degree in the tank, prevents too high a vacuum from being obtained.

The vacuum line from the tank is at-

SOLVE Valve Corrosion Problems

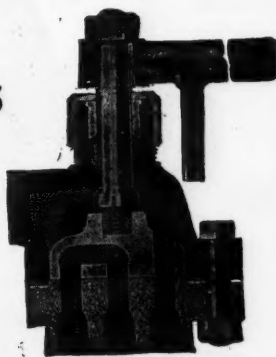
WITH

→ **NICHOLSON**
CYLINDER CONTROL VALVES

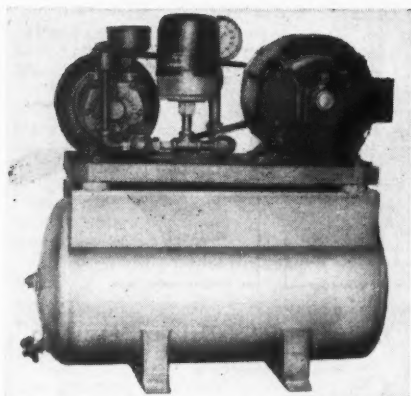
CUSTOM CONSTRUCTION enables you to meet the problems presented by specific mediums and pressures. Choice of 6 different metal combinations. Nicholson control valves also feature specially treated, extra hard seats that don't cut out, affording maximum "slow wear"; trouble-free simplicity. Pressures to 500 lbs.

W. H. NICHOLSON & CO., 136 Oregon St., Wilkes-Barre, Pa.

Catalog 546



2-, 3-, 4-way, multi-port, metering, distributing, and special types; lever, foot, solenoid and motor types; for air, steam, oil, gas, tar, water.



Leiman Motor-Driven Vacuum Priming Unit

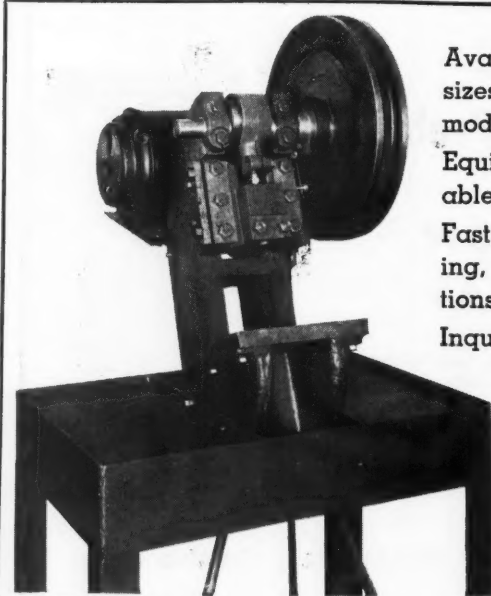
tached to the water pump to create the vacuum in the water lift pipe and, when the water rises and enters the pump, which has already been placed in actual operation, it is prevented from following the suction line into the tank by an interrupting automatic valve or by a hand valve.

The vacuum priming unit can be furnished in many sizes, depending on the size of the lifter pipe, actual height of water lift, and the time limit.

Airco Aluminum Brazing Flux and Wire

To meet the demand for a high grade yet economical flux with a satisfactory low-melting point, the Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y., has placed on the market Elite Aluminum Brazing Flux which is designed exclusively for aluminum brazing. Due to the physical properties of the flux, Airco No. 26 Wire, widely used throughout industry for general purpose welding, is now adaptable for brazing 2S, 3S, 53S, and 61S aluminum.

Alcoa No. 716 Brazing Wire now being distributed by Air Reduction is highly recommended for brazing 53S and 61S aluminum alloy analyses. Both Airco No. 26 and Alcoa No. 716 are said to provide excellent results in the fabrication of a wide variety of aluminum products from cooling utensils and electrical appliances to metal furniture, window frames, and other extruded aluminum shapes.



Available in 4½, 6 and 15 ton sizes — either Bench or Floor models.

Equipped with motors and available for immediate delivery.

Fast, accurate—stamping, forming, blanking and other operations.

Inquire about our 15 ton model.

Write for complete details.

Wm. Brewer Machine Co.

75 Laurel Street

Hartford



Conn.

"Paintbond" Solution

A solution for use in the simple, fast, economical preparation of aluminum and its alloys for painting or lacquering, to be known as "Paintbond," is now being offered by the Colonial Alloys Co., Technical Processes Div., Philadelphia, Pa. Used at room temperature for 30 to 60 seconds, the solution can be applied to any alloy of aluminum by the spray, brush, or dip method, the latter being preferable.

The procedure consists of freeing the aluminum of greases and dirt and immersing in the Paintbond solution for approximately 30 to 60 seconds and then rinsing the drying. The metal is now ready for painting and lacquering. Primers that are suitable for aluminum should be used prior to final finish coats.



"Men-E-Uses" Power Drive

"Men-E-Uses" Power Drive

Designed to meet practically any fractional horsepower drive requirement, the "Men-E-Uses" Power Drive illustrated herewith, product of The Flinchbaugh Co., 750 S. Court St., York Pa., has a range of from 20 to 750 r.p.m. with 1,725 r.p.m. motors. With an additional aux-

iliary shaft, the unit can be operated at a speed as low as 4 revolutions per minute.

Light in weight (12 lb.), the Men-E-Uses Power Drive includes a base and housing of aluminum and has a universal motor mounting for $\frac{1}{2}$ h.p. motors and under. The height of the unit is adjustable, depending upon the length of posts

MODEL No. 16 "SPECIAL"

CONSTRUCTED AS PER SPECIFICATIONS OF U. S.

NAVAL AIRCRAFT FACTORIES

BUTTERFLY FILING and SAWING MACHINE

(Die Making Machine)

This is a very heavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D—10" Table; Model E.L.—12" Table. Model No. 14—14" table and heavy pedestals for all our machines.

HARVEY MFG. CORP.

161 GRAND ST., NEW YORK 13

Inquiry Dept.

Phone CAnal 6-5170



BEWARE OF IMITATIONS

Our machine carries the Butterfly trade mark.

Registered U. S. Patent Office

used. Either direction of shaft rotation can be obtained by mounting the motor right or left on the base. The power drive is said to in no way depend upon the direction of the motor rotation and can be quickly and easily changed from one piece of equipment to another.

Micro Height Gage

A heavy duty height gage for fast and accurate inspection operations is now being marketed under the designation of Micro by the Tool Specialties Co., Raymond Commerce Bldg., Newark 2, N. J. The unit can be equipped with height, depth, and indicator extensions, as well as a scriber for use in connection with sine bars and sine plates, dies, jigs, fixtures, tools, machines, motor and engine assembly, setting spindles in relation to face and holes, setting cutters on shapers, milling, boring and other machines, measuring with balls from centers, keyways, concave slots, and so on.

Available in the form of sets including and excluding attachments, the Micro Height Gage has a tolerance of ± 0.0005 inch, vertical and horizontal. (A screw jack of the same gage construction but with tolerance of ± 0.0005 inch, vertical

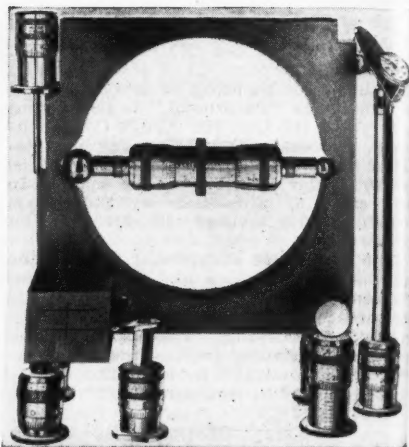


Illustration depicting various applications of the Micro Height Gage and Micro Screw Jack

only, is also available.) The unit has a base diameter of $1\frac{1}{2}$ inches, gaging range of $1\frac{1}{4}$ to $2\frac{3}{4}$ inches plus extensions and attachment, and is said to safely support a load of 1,000 lb. with accuracy.

MILWAUKEE SURFACE PLATES



36" x 48" . . . semi-steel . . . accurately machined. Securely mounted cast legs are machined and provided with adjusting screws for perfect alignment. Shipping weight, 1300 lbs. Also larger or smaller plates with planed or scraped surface. We also manufacture angles and parallels as shown underneath surface plate.

Write for details.

J. C. BUSCH CO.

Engineers and Machinists Since 1907
26 E. PITTSBURGH AVE. MILWAUKEE, WIS.

"Tri-Core" Solder

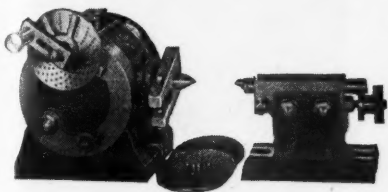
A solder having three independently filled cores of pure rosin flux, to be known as "Tri-Core," is now being marketed by the Solder Development Division, Alpha Metals, Inc., 369 Hudson Ave., Brooklyn 1, N. Y. According to the manufacturer, a continuous supply of high grade non-corrosive rosin flux is always present in the solder since the three cores are completely independent of each other.

The arrangement of the three cores is such as to place them very close to the surface, thus not only enabling the solder to melt quickly, but also allowing the heat to penetrate to the flux rapidly and thereby permit it to flow freely and reach the work ahead of the molten solder. Careful cross-sectional proportioning and the absence of surface seams prevent premature sweating out of the flux, thus making the solder clean to handle at all times, the manufacturer claims.

Said to exceed A.S.T.M. Class A specifications, Tri-Core Solder is available in all alloys, flux percentages, and gauges.

Carroll Dividing Heads

The Troyke Mfg. Co., 4422 Appleton St., Cincinnati 9, Ohio, announces that it has purchased the business and plant of William Carroll and Son, manufacturer of dividing heads. As a result, the dividing heads will continue to be pro-



Carroll Dividing Head

duced by the latter firm but will be marketed by Troyke under the name of Carroll.

The Carroll Dividing Head is available in four models ranging in size from 6 to 12 inches.

Lincoln "Fleet-Arc" A.C. Welder

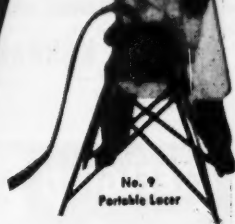
Featuring ease of welding, unusual depth of penetration, wide range of output, economy of operation, safety, dependability, and long service life, an a.c. welder equipped with an "Arc Booster," to be known as the "Fleet-Arc," is announced by The Lincoln Electric Co., Cleveland 1, Ohio. The Arc Booster augments the current the instant the arc is struck, the arc being started automatically the moment the electrode touches the work.

A selector switch on the front of the welder governs the amount of booster current to be used in striking the arc, thus providing for a complete range of striking intensity to suit requirements in the welding of thin sheets or heavy plates, making of tack welds, or in the use of various types and sizes of electrodes. The Arc Booster enables the operator to obtain maximum depth of penetration in each job and has the added facility of attaining the maximum depth at the beginning of the weld.

Current control, continuous and self-adjusting, is provided by a rotating reactor control which allows for fast setting throughout the unusually wide range of the welder. The operation of the current control is fast and involves the simple act of turning a handwheel which requires a minimum number of

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Portable Lacer

In over 30 years experience manufacturing belt lacing equipment exclusively, Clipper has developed the world's finest belt hooks. To get the best service from these top quality hooks apply them with a modern belt lacer such as the Clipper No. 9 Portable. This combination will save you money. See your Mill Supply Jobber for demonstration.

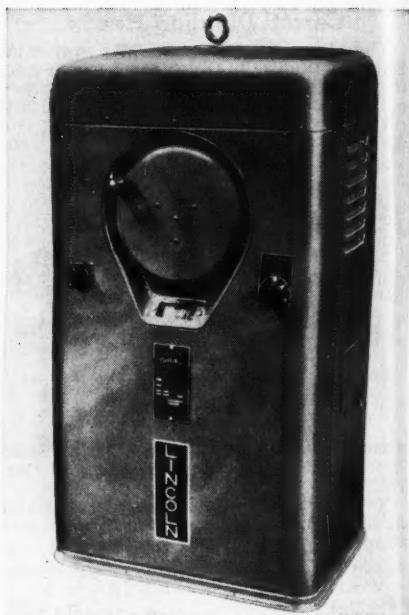
CLIPPER BELT LACER COMPANY, Grand Rapids 2, Michigan



turns to cover the range. The amperage is indicated on a calibrated dial on the face of the welder, located in a weather-proof and readily visible position.

The reactor current control, which is held in position by cone brakes and actuated by a self-cleaning chain drive, is described as smooth running and durable. Arc characteristics of the Fleet Arc are said to be excellent, with the reactor control designed for high responsiveness to changing arc conditions.

A thermostatic control, which opens the magnetic starter when overloaded, provides a high degree of self-protection



Lincoln "Fleet-Arc" A.C. Welder

for the operator, thus permitting sustained welding at high current values and use under abnormal conditions with complete protection against damages resulting from overheating, the manufacturer claims. A high power factor and reduction in the number of condensers required, together with minimum shock to the operator, have been achieved through the use of a low open-circuit voltage.

The Fleet-Arc A. C. Welder is manufactured in 200, 300, and 500-amperage ranges.

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Astrong lacing for all types of belts. Put on with a hammer in a few minutes. Clinches smoothly into belt, compresses ends, prevents fraying. 2-piece hinged rocker pins provided, 11 sizes. In boxes, handy packages, cartons and long lengths. Write for catalog sheets.

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20" Long x 12" Wide x 6 1/4" Deep
16 Ga., drag holes, handles both ends.



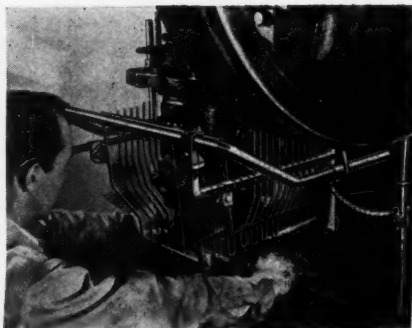
J. L. LUCAS & SON, INC.
BRIDGEPORT 5. CONN.

Junkin Swinging Die Closure

Featuring a protective Plexiglas shield, a power press safety guard to be known as the Junkin Swinging Die Closure has been announced by the Junkin Safety Appliance Co., Inc., Louisville, Ky. Custom built to fit power presses used in blanking operations, the guard, as a result of the clear transparent Plexiglas shield located near the front of the closure, affords the press operator an unobstructed view of the blanking operation. Since it is said to be shatter-resistant and splinterproof, the shield also protects the operator from flying metal particles, and is mounted in an adjustable frame, thus permitting horizontal movement to accommodate any change in power press operation.

If necessary, the crystal-clear shield may be swung up and out of the operating position to allow adjustment of the power press. The shield can be easily cleaned by washing in soap and water or by wiping with a damp chamois, and may be polished with a good grade of automobile paste wax to enhance its lustrous transparency. According to the manufacturer, the shield is rigidly held in its metal frame and will not warp from long usage.

The Junkin Swinging Die Closure is



Junkin Swinging Die Closure installed on a power press

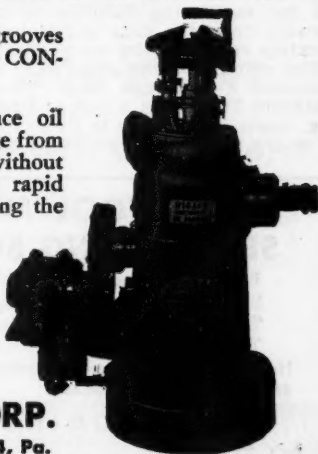
also said to permit easy and safe access to the dies when necessary. A double pivot awning bracket allows the operator to pull the closure forward from a set position and to swing it out of the way without changing the guard adjustment or die. An additional feature is a safety key located in the strip box connection of the pedal rod which is said to eliminate accidentally tripping the press.

OIL GROOVING made easy by WICACO

The WICACO Continuous Oil Groover can cut grooves of all descriptions INTERNAL or external — CONTINUOUS or intermittent.

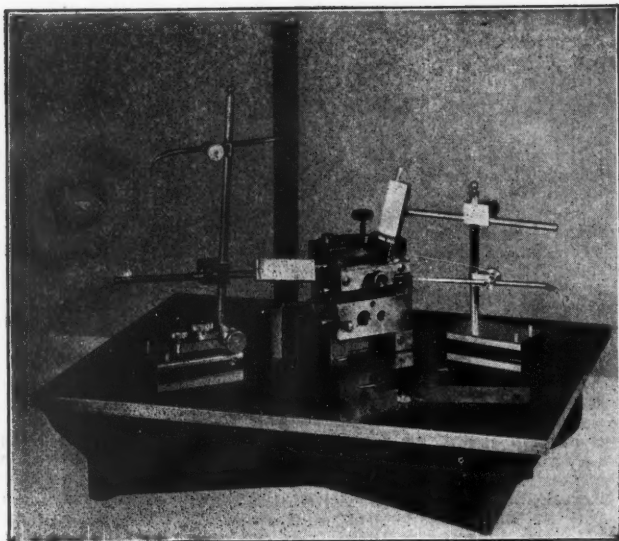
Operators need no special training to produce oil grooves with this highly flexible machine. Change from one grooving job to the next is readily done without delay. Its upright spindle and chuck permit rapid loading and unloading of work without stopping the machine.

It will pay you to investigate the remarkable, low cost results the WICACO Continuous Oil Groover offers. Write today—outline your oil grooving problem and complete information will be sent without obligation.



THE WICACO MACHINE CORP.

Stenton Avenue and Loudon Street, Phila. 44, Pa.



Universal Toolmaker's
Surface Gages in Use

use on cylindrical work.

The fine adjustment and positive lock features of the gage are said to make it an ideal tool for laying out precision work on jig borers, milling machines, and inspection plates. The accompanying illustration shows the surface gage being used with indicator attachments to test inside and outside surfaces of workpieces.

Universal Toolmaker's Surface Gage

Incorporating a safety feature that is said to positively prevent spindle slippage and the resultant loss of measurements, a universal toolmaker's surface gage having precision ground surfaces is now being marketed by Andrew Genales, Nyack, N. Y. The spindle drawbolt has a positive lock and, when the spindle is set for measuring heights or drawing parallel lines, the gage is claimed to accurately remain in its set position.

The spindle of the gage is $\frac{1}{8}$ inch in diameter x 9 inches long. The block measures $3\frac{1}{4}$ x $2\frac{1}{2}$ x 1 inch and has a 90-deg. angle at the base to fit any surface of 90-deg. angle, as well as to allow for

Willard C. Beach "Sta-Dri" Air Conditioning Unit

Designed to screen out scale, rust, and dirt from compressed air pipe lines, as well as to extract moisture and oil fumes and to regulate air pressures to any desired lower level, an air conditioning unit to be known as the Willard C. Beach "Sta-Dri" is now being marketed by the Beach Precision Parts Co., 120 Mechanic St., Boonton, N. J. Constructed for long trouble-free operation, the unit is ruggedly built and is said to be capable of delivering absolutely clean dry air with a minimum of frictional line drop.

Incorporating a gage which indicates final pressure used, the unit is available in two models; namely, Model A-1 Junior

TOOL MAKERS SELF LOCKING BORING CHUCK

Body Diameter— $1\frac{1}{2}$ "; length $1\frac{1}{4}$ "

Shank Diameter— $\frac{1}{2}$ "; length $1\frac{1}{2}$ "

Tool Movement— $\frac{1}{8}$ " adjustable in thousandths

Tool Diameter— $\frac{3}{8}$ "

Hardened and tempered screw, tool block and shank.

SPECIAL SHANKS AVAILABLE. F.O.B. Manchester

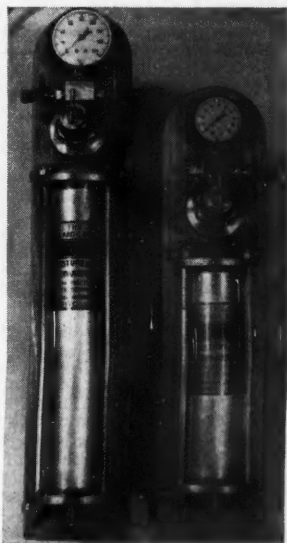
SMITH BORING CHUCK CO.

Box 69

Manchester, Connecticut



for handling approximately 30 cubic feet of air per minute at 100 lb. pressure, and Model A-2 Senior for handling approximately 65 cubic feet of air per minute at 100 lb. pressure. The Model A-1 Junior is supplied complete with one extra Sta-Dri filter and has a shipping weight of 14 lb. The Model A-2 Senior is sup-



Willard C. Beach "Sta-Dri" Air Conditioning Units

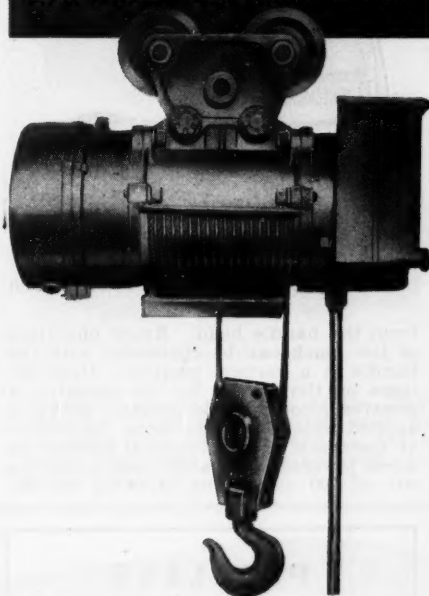
plied with two extra Sta-Dri filters and has a shipping weight of 16 lb. Both models are panel mounted for convenient installation.

According to the manufacturer, the Willard C. Beach Sta-Dri Air Conditioning Unit is useful in connection with air lines for spray guns, chipping tools, small riveters, air hammers, grinders, and similar pneumatic tools.

Lewis-Shepard Power Jacklift

Vertical handle operation and electric braking are features of the Lewis-Shepard Power Jacklift now being manufactured by Lewis-Shepard Products, Inc., 248 Walnut St., Watertown 72, Mass. Available in both platform and pallet models, the unit is described as an electrically-operated hand lift truck with complete electric push-button control

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Electric Cable Hoist

measures only 26-5/16" x 15"
and weighs about one-half of
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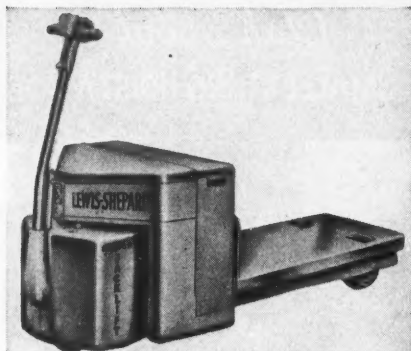
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LISBON, OHIO



Lewis-Shepard Platform Model Power Jacklift

from the handle head. Every operation of the truck can be controlled with the handle in a vertical position. Upon release of the handle by the operator, a positive smooth-action electric brake is applied which instantly stops the motion of the truck. In the vertical position or when lowered, the handle has a steering arc of 200 deg., thus allowing for ac-

curate loading, lifting, traveling, lowering, and spotting of loads under all conditions.

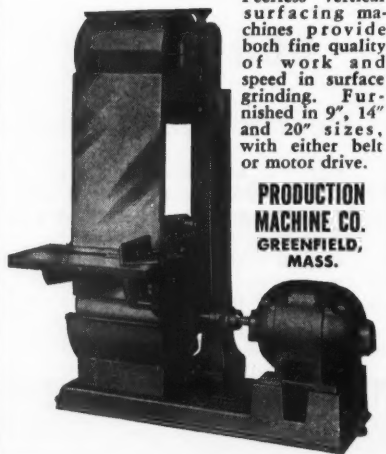
The Lewis-Shepard Power Jacklift is driven by means of an electric master drive unit that is readily replaceable. With the gear drive and all wheels mounted on ball bearings, totally enclosed and packed in grease, smooth, dependable operation is said to be assured. The truck is available in several lengths, and the platform model can be obtained in both wide and narrow designs.

Marshall Steel

A ready-to-use carbon tool steel for tool and diemakers, machinists, and other steel users, to be known as Marshall Steel, is now being produced by Marshall Steel, 228 N. LaSalle St., Chicago 1, Ill. The steel is available in thicknesses of 1/64 to 1 1/4 inches, in widths from 1/4 to 10 inches, and in standard 18-inch lengths for ease in handling and inventory control.

Marshall Steel is fully annealed for easy machining. Heat treating is accomplished by a normal procedure using either a brine or oil quench. Chemical as well as physical properties are said to be controlled and held to the highest of standards, and precision grinding of the steel on modern equipment provides for a smooth velvet finish. Marshall Steel is claimed to be ideally suited for templates, models, dies, jigs, gages, and numerous other items.

PEERLESS Vertical Abrasive Belt Surfacers



Peerless vertical surfacing machines provide both fine quality of work and speed in surface grinding. Furnished in 9", 14" and 20" sizes, with either belt or motor drive.

**PRODUCTION
MACHINE CO.
GREENFIELD,
MASS.**

Sapphire Products Diamond Polishing Compound

A diamond polishing compound composed of close-graded virgin diamond powders is now being marketed by the Sapphire Products Div., Elgin National Watch Co., Aurora, Ill. According to the manufacturer, its paste vehicle provides for perfect dispersion, the diamond powders being kept in constant uniform suspension. The special vehicle housing the compound is described as non-toxic and non-deteriorating. Its viscosity is such that it possesses unusual clinging properties and may be used on high speed laps without throwoff.

Designed for use with a gun-type applicator which protects the diamond powder from contamination and also meters the quantities of diamond used, the Sapphire Products Diamond Polishing Compound is available in several grades, each

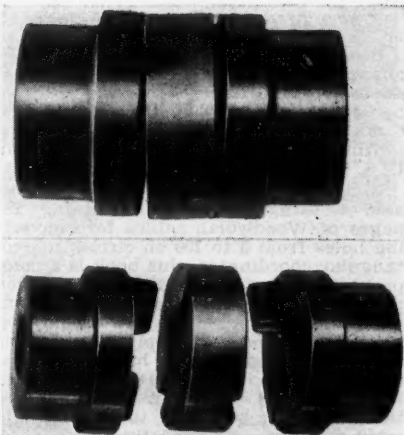
grade being identified by an individual color. No special tools or laps are required for using the compound, which is said to be particularly applicable for the finishing of steel molds used for plastic molding as well as other metal products.

IMW Flexible Coupling

A flexible coupling based on the gear-tooth principle is now being marketed with the designation IMW by Industrial Machine Works, Inc., South Hanover, Mass. Two identical end pieces with involute gear teeth mate with a center piece containing rack grooves running transversely on opposite sides. This design is said to provide for simultaneous automatic correction of angular and parallel misalignment. The center piece is made of lubricant impregnated sintered bronze unless otherwise specified.

Suitable for high speed application, the IMW Flexible Coupling has a torque capacity in standard sizes up to 1,500 inch-pounds. In addition to sizes up to 1 3/4-inch shaft diameter, the company is prepared to offer tailor-made units to individual manufacturer's specifications.

According to the manufacturer, the



IMW Flexible Coupling

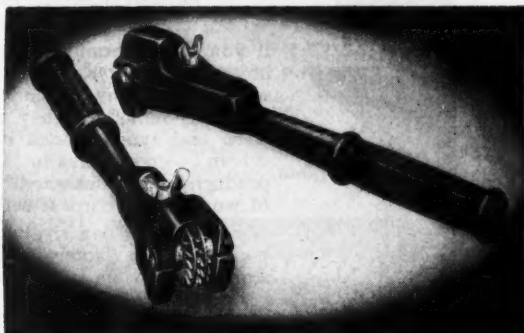
simplicity of construction of the IMW Flexible Coupling allows for easy installation and inspection, and the three-piece gear-tooth design provides for quiet operation.

GRINDING WHEEL DRESSERS



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CHAMPIONS pay off in top performance and tool economy. The patented-design assembly cap adds safety. Spindle bearings guide the cutters preventing wobbling and wear. Handle and cap last indefinitely, and mounting either Star or Corrugated Cutters, will give peak performance on any mechanical straight-face dressing job in the shop. For your best tool buy, always choose from the line of CHAMPIONS.



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COAST TO COAST.

New Books

Precision Hole Location for Interchangeability in Toolmaking and Production. By J. Robert Moore. Published by Moore Special Tool Co., Bridgeport, Conn. 448 pages. Illustrated. Price (within metal-working industry), \$3.00 in U. S. A.; \$3.50 elsewhere.

Illustrated with over 400 photographs and working drawings, including 184 pages of Woodworth tables for converting holes from 3 to 100 on circles to rectangular coordinates, this book is a comprehensive review of all hole location practices and their evolution to the point where the toolmaker can now employ engineered methods and apply the principle of interchangeability to his own operations. The book discusses all of the laborious and time-consuming hole-location methods used prior to the development of modern hole-locating equipment. Comparisons are made between the old methods and new methods on actual jobs.

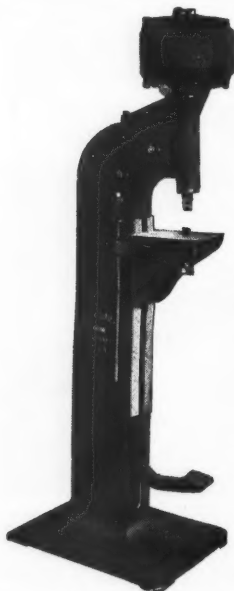
After tracing the evolution of the jig borer and analyzing different types, a chapter entitled "Jig Boring Practices," which contains over 100 photographs and drawings, presents instruction and operational short-cuts dealing with a com-

plete range of tools and dies, and provides time estimates on a variety of different jobs. An extensive chapter, entitled "Hole Grinding in Jig Time," describes in detail the modern methods for finish grinding holes in hardened parts.

In the concluding chapter, "Now—Interchangeability in Toolmaking," the book shows the toolmaker how to obtain the most out of modern hole-location machines—boring and grinding—by using them in conjunction with each other.

W. J. Woodworth a toolmaker, tool designer and tool supervisor of 40 years' experience, recognized the difficulties in laying out holes on circles. With his son he developed tables calculated in rectangular coordinates for circles divided into 3 holes up to and including 100 to enable jig borer operators to obtain the correct figures with the least effort. According to the publisher, the tables and drawings are available in this book for the first time.

How to Prepare an Employee's Handbook. By Charles C. Mercer and the staff of National Foremen's Institute, Inc., 10 High St., Deep River, Conn. 300 pages, 7 x 9 $\frac{3}{4}$ inches. Loose-leaf, steel-



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If you are a manufacturer of novelties, tools, instruments, household devices, electrical goods, etc., fast precision riveting with Linley Machines will be one of your very best assembly methods. They are available in a wide range of sizes and types, bench or pedestal, belt or direct motor driven . . . capacities to $\frac{1}{2}$ " rivets. Built for day-in, day-out production and designed to maintain accuracy and quality of work under hardest service conditions.

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ring binding; gold-stamped fabrikind binder. Price, \$17.50 f.o.b. shipping point.

This comprehensive volume is designed to guide management officials in the planning and production of an employee-information manual along lines that have been found effective by a number of companies. One section of the handbook covers 578 topics of interest to employees, ranging alphabetically from "absence from work" to "workmen's compensation." Seventeen hundred examples are given of the way representative companies dealt with these subjects in their handbooks. Cartoons by Michael V. Sintal head each alphabetical section and illustrate such topics as fire prevention, negligence, paydays, quality workmanship, recreation, and so on.

Another important section provides a popularized digest of federal legislation affecting workers, including the Wagner Act, the Wage and Hour Law, Social Security Act, GI Bill of Rights and similar laws. The handling of handbook material on "Company History" and the "Employee's Job" are treated in two other sections.

The organization, writing, and assembling of the complete handbook are discussed in a separate chapter. As shortcuts to production of an effective handbook, several plans are offered to company officials whereby they can use all or part of the instruction material and cartoons already prepared by the National Foremen's Institute. The Institute also has inserted in the back cover a sample employee's handbook which was prepared for its own personnel by using the new ideas and material contained in "How to Prepare an Employee's Handbook." A particularly noteworthy item included in the model handbook is a set of tables on employee withholding taxes.

Manual of Industrial Relations. By Bruno R. Neumann and Arthur T. Jacobs. Published by National Foremen's Institute, Inc., Deep River, Conn. 185 pages, 9½ x 11¼ inches. Loose-leaf gold-stamped fabrikind binder. Price, \$7.50 f.o.b. shipping point.

This handbook is designed to direct its 185 pages of instruction and information at foremen and at those top company officials responsible for the training of supervisors in their industrial relations duties. It provides extensive training and information for foremen on such subjects as grievances, employee morale, wages and wage incentives, training of

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employees, principles of collective bargaining, unions and latest collective bargaining developments, and the Federal labor laws on labor relations, wages, hours, social security, and public contracts.

In an important appendix, the authors discuss the special problems and complaints of foremen and the reasons why they join foremen's unions. A suggested program of foremen's relations, called to the attention of top management, outlines the principles of evaluating supervisory jobs.

Three chapters of the manual are devoted to instruction on some 60 types of problems arising between supervisors and employees. Among these are problems headed: Representing Top Management's Viewpoint; Promoting from Within; Personnel Policies; Wage Policies; Fostering Personal Views as Company Policy; Enforcing Company Rules; Employee Wants; Problem Employees; The Grouchy Foreman; Breaking Promises; Showing Favoritism; Incomplete Instructions; Withholding Credit; Faults of Grievance Procedures; and Procedures Are Not Enough.

How to Supervise People in Industry. By Dr. Elliot D. Chapple and Edmond F. Wright. Published by National Foremen's Institute, Inc., 10 High St., Deep River, Conn. 123 pages. Cloth binding, board covers. Price, \$2.50.

In this book, an endeavor is made by the authors to show management officials and primarily foremen and other supervisors how to apply human relations principles in dealing with workers. The book deals with such specific personnel problems as discipline, methods of introducing changes, finding and eliminating causes of employee dissatisfaction, and training the new employee.

Particular emphasis is placed by the

authors on the keeping of proper records by foremen. They explain the content and work value of job descriptions, job standards, planned materials handling, and work schedules. A sample job description illustrating the activities of one operator and the duties of related workers is included in a chapter entitled "How Production Affects Human Relations."

In another part of the book, personality problems are charted by types and methods of handling. The technique of interviewing job applicants and their proper placement is also explained on a step-by-step basis.

Principles of Tool Engineering. By Raymond R. Bloom. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. 234 pages. Illustrated. Cloth binding, board covers. Price, \$2.40.

Designed to furnish students in tool engineering with a background in interchangeable manufacturing, this book includes material which has been tested in classes conducted by the author over a period of 15 years. These classes consisted of men in industry who knew the practical application of tools and also understood machine drawing but who still needed the fundamentals of tool engineering in order that they might be upgraded to the position of tool designers in their companies.

The text does not cover all of the principles involved in tool engineering but does describe in simple language, supplemented by illustrations and tables, the problems encountered and the need for tools, jigs, fixtures, and gages. One of the outstanding features of the text is the contrasting of the mating system with the manufacturing system. An advantage is the fact that the student is made aware of the principles of dimensioning, not only for a single component but for those components that mate.



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The text clearly describes the application of A.S.A. standards to mating parts after the data have been taken from the pamphlet.

The contents of the book are divided into 18 chapters which are headed as follows: Systems of Production; Interchangeability; Dimensioning; Tool Engineering; Relationship; Analysis; Machine Tools; Milling Machines; Milling Fixtures; Locating and Clamping; Drilling Machines; Drill Jigs; Drill Jig Bushings; Materials; Horizontal Turret Lathes; Inspection; Gages; Problems in Tool Engineering. A list of visual aids and an index are provided at the rear of the book.

How to Handle Problems of Seniority.

By Dr. John A. Lapp. Published by National Foremen's Institute, Inc., 10 High St., Deep River, Conn. 295 pages, 5 x 8 inches. Library buckram binding. Price, \$4.00 f.o.b. shipping point.

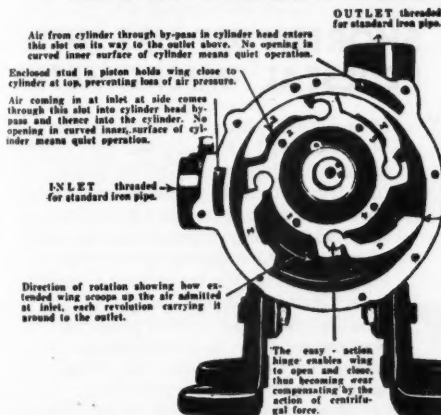
This detailed handbook on seniority is based on company case histories, government and court rulings, as well as the author's own extensive experience as an arbitrator in more than 50 seniority disputes. He has also drawn material

from his labor relations background as a division chairman with the Coal Labor Board, a referee on the National Railroad Adjustment Board, and a member of the Petroleum Labor Policy Board.

"How to Handle Problems of Seniority" covers such topics as: the background, definition and range of seniority; straight seniority and modified types; craft, departmental, plant-wide and system-wide seniority; how seniority is acquired and how it is lost; the seniority of veterans; promotions according to seniority; seniority problems involved in layoffs, sharing of work, rehiring and transfers; leaves of absence and the retention of seniority; the administration of seniority systems; disputes and grievances over seniority; railroad seniority and seniority as tested in the courts and before boards and arbitrators. In addition, a full text of seniority provisions in collective bargaining contracts between managements and unions in different major industries is provided at the rear of the book.

Every topic and problem is explained with examples of actual seniority practices. Where pertinent, the author includes a discussion of the experiences management has had with the different approaches to seniority.

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machines, cooling linotype machine molds, gas and oil burning appliances, furnaces, blowpipes, etc., used in hospitals for etherizing, vacuum treatments, wound cleaning in operations; all sorts of operations in filling bags, cartons, collapsible tubes, and containers of all sorts; for creating instant and high heat in steam radiators; for vacuum holding chucks and for hundreds of other uses.

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NEWARK 5, N. J.

Metco Metallizing Handbook. Fourth edition. Published by Metallizing Engineering Co., Inc., 38-14 30th St., Long Island City 1, N. Y. 86 pages. Illustrated. Price, \$2.00.

In addition to up-to-the-minute data on the preparation of surfaces, metallizing technique and finishing procedure, this volume contains complete information on corrosion resistance, specific gravity, hardness, bond strength, tensile strength, and relative shrink in many interesting chapters.

Profusely illustrated with photographs, drawings, diagrams, charts, and graphs, the pocket-size handbook presents both the practical and technical aspects of the metallizing process in complete detail.

How to Use Handicapped Workers. By Arthur T. Jacobs. Published by The National Foremen's Institute, Inc., Deep River, Conn. 181 pages, 5½ x 8 inches. Library buckram binding. Price, \$3.50 f.o.b. shipping point.

This volume is designed to aid employers, personnel officials, foremen, and supervisors in making successful use of the physical, mental, and temperamental

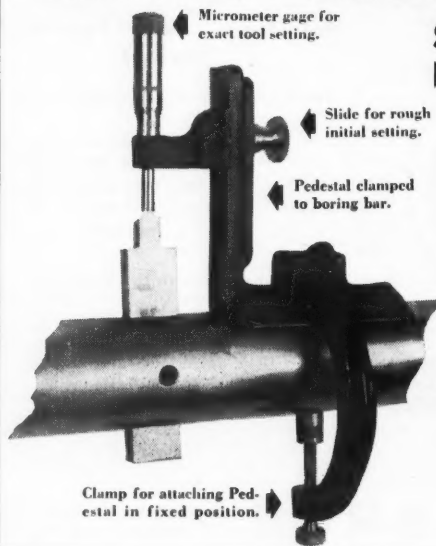
abilities of all employees. Four techniques are explained: (1) how to analyze the physical demands of a job to find out what characteristics of mind and body the worker must have; (2) how to evaluate the capacities of handicapped individuals to determine what jobs they can handle best; (3) how to match the handicapped with jobs they can fill as well as the non-handicapped; (4) how to break in the handicapped on new jobs.

A feature of the book of particular interest to management is an 80-page appendix which summarizes various physical and mental handicaps. For each type a description is given together with an evaluation of its effect on working ability, things to note in placement interviews with persons so handicapped, and medical reports that may be helpful. A useful chart, 13 x 15 inches, summarizes the physical demands for 105 occupations covered by apprenticeship programs.

Heat Treating Aluminum Alloys. By O. L. Mitchell and G. W. Birdsall. Published by Reynolds Metals Co., Dept. 47, 2500 S. Third St., Louisville 1, Ky. 144 pages 6 x 9 inches. 81 illustrations, 13

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Model "AM" Bartelt Pedestal Micrometer (shown) is designed for setting tools in boring bars. Conventional cut-and-try method is unnecessary as tool can be brought to exact position in only one setting. Speed and accuracy of adjustment reduces set-up time and helps importantly to increase production. Bartelt gages, available in six models, are valuable and practical shop equipment for tool adjusting, work positioning, inspection, checking, and many other gaging operations. Write for descriptive circulars today, showing eight models now available for various kinds of work.

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tables, 10 photomicrographs, 2 charts. Wire binding. Price, \$1.00.

The purpose of this book is to provide information on the heat treating of aluminum alloys in a form readily usable by both the non-technical man and the highly trained technician. To attain this end, the first section of the book breaks down the subject into easily understandable concepts which the non-technical reader can follow and so obtain a basic understanding of the metallurgy and heat treatment of the aluminum alloys. Section Two then presents in brief tabular form the recommended thermal treatments for the various aluminum alloys.

Section Three, which is intended for the metallurgist and operating personnel, provides a more technical discussion of the various thermal treatments, as well as detailed information on possible difficulties and suggestions for their cure. In addition, abnormal as well as normal metallographic structures are illustrated by an extended series of excellent photomicrographs that will be found very helpful by the metallographer in controlling the quality of the heat-treated material.

Manual of Design for Arc Welded Steel Structures. By LeMotte Grover. Published by Air Reduction Sales Co., Dept. MD, 60 E. 42nd St., New York 17, N. Y. 300 pages. Price, \$2.00.

Compiled by a widely-recognized authority in the field of structural welding, this book offers a wealth of useful, up-to-date information covering fundamentals of design, materials, inspection, estimating, and engineering control of welding and related operations. Chapters are included to encompass electrode requirements, specifications for welded connections for all sizes of rolled beams, and a series of diagrams for the rapid design of welded connections.

Pointed, concise, and complete, the book is based largely upon standards of the American Welding Society, the American Institute of Steel Construction, and upon reports of the Welding Research Council of the Engineering Foundation. Although the information on standardized beam connections and many of the details of design have been compiled especially for use in building construction, many of the design diagrams and fundamental principles may be applied to the design and engineering control of other types of welded steel construction.

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Gloucester City, N. J.

Rarer Metals. By Jack De Ment and H. C. Dake. Published by Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. 432 pages. Illustrated. Cloth binding, board covers. Price, \$7.50.

Prepared as the result of a need for a concise book in which the mineralogy, chemistry, physics, and technology of rarer metals are described, this volume correlates basic data on such metals for the busy professional man and student and is said to be suitable as a reference text or for supplementary reading in science and engineering courses. Special consideration has been given to rarer ele-

ments upon which much of our future progress may depend.

Some twenty elements, excluding the metals of the rare earths on which there is extensive literature, are discussed briefly, including some of the interesting and important practical applications of these items. The book does not provide a survey of analytical methods, but, rather, newer tests, such as those of microchemistry and flurochemistry, are discussed. The stress is laid upon specific tests which can be performed rapidly with simple equipment and satisfactory results.

The contents of the book are divided up into sections as follows: Introduction; Beryllium; Gallium-In d i u m-Thallium; The Silicon Family Elements; Vanadium-Columbium-T a n t a l u m ; Molybdenum-Tungsten-Uranium; Selenium-Tellurium; The Platinum Group Metals; Appendices; and Indices.

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Aluminum Alloys and Mill Products. Published by Reynolds Metals Co., Dept 47, 2500 S. 3rd St., Louisville 1, Ky. 248 pages, 6 x 9 inches. 106 tables. Wire binding. Price, \$2.00.

Prepared as the result of a great demand for technical information on aluminum alloys, this book, after briefly describing the history of aluminum, discusses alloy tempers and physical properties, and presents detailed data on the chemical, physical and mechanical properties of high purity aluminum, including nominal chemical compositions, typical mechanical properties, values of density of co-efficients of expansion, thermal and electrical conductivity, annealing and heat-treating cycles for wrought, sand-casting, and die-casting alloys.

Subsequent chapters deal with various mill products, covering such subjects as manufacturing methods, alloys and tem-



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pers in which the particular product is made, identification, packing, ordering, commercial and standard sizes, specified chemical compositions, specified mechanical properties, commercial size and thickness tolerances, weights, weight conversion, bend radii, pressure calculations (for tubing and pipe), and similar information. Sections are devoted to the following mill products: sheet and plate; extruded shapes; roll formed shapes; tubing and pipe; wire, rod, and bar; forging stock; ingot metal; and pressed forgings. In addition, a group of reference tables provided includes a comparison of gauges; decimal equivalents; shrinkage allowances for castings; relative weights of various metals; and principal characteristics of various wrought aluminum alloys in sheet form and also forging alloys.

A section on related specifications is arranged according to alloy designations, which are then broken down into the various product forms, and related specifications applying are listed, including Federal, Army and Army Air Forces, Navy, Army-Navy (AN) Aeronautical, S.A.E. Handbook, A.M.S., and A.S.T.M. specifications.

A unique feature of the book is the color index scheme employed to facilitate

location of the various material. A color flag appears on each two-page spread that ties in with a color index in the front of the book to speed the locating of any particular section desired.

Manual for Heat Treating Services.
Published by Metal Treating Institute, 420 Lexington Ave., New York 17, N. Y. 3½ x 11-inch loose-leaf pages. Illustrated. Price, \$4.00.

This manual is designed to assist manufacturers in obtaining full advantage of commercial heat-treating services by informing them of the range of heat-treating services and thereby enabling them to intelligently specify their needs. The book contains several sections dealing with such subjects as steel selection; peacetime NE steels; machinability; grinding; relationship between heat treatment and design; basic principles of heat treating; various heat treatments; non-ferrous heat treating and brazing; cold treating; preparation and care of steel surfaces before, during, and after heat treating; inspection and testing; and ordering heat treating. A glossary of metallurgical terms is also included in the book.

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21/64"	2.58
11/32"	2.58
23/64"	2.87
3/8"	2.87
25/64"	3.17
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New Shop Literature

Combination Broaching Manual and Catalog. Designed specifically for the use of shop and manufacturing executives, master mechanics, and chief tool engineers, as well as purchasing agents, a limited-edition, strikingly illustrated, 172-page combined broaching manual and catalog covering virtually every phase of broaching methods, broaches, and broaching equipment has been published by the Colonial Broach Co., P. O. Box 37, Harper Station, Detroit 13, Mich. The book is divided into six sections. The first section is in the nature of an introduction, including such material as a history of modern broaching development and illustrated text dealing with the manufacture and heat treating of broaches. Following this is a section under the heading of "Broaching." In this section are covered such matters as broaching fundamentals, broach design, how to prepare for broaching, how to estimate production, how to get the most out of broaches, and care and sharpening of broaches.

Section 3, "Broaching at Work," contains 42 pages of illustrations and data on all types of broaching operations.

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The basic sub-divisions are "internal" and "external" broaching. Each sub-division in turn is divided into sub-classifications to permit easy location of typical examples covering almost every type of machining problem which can be handled effectively by broaching, ranging—in the case of internal broaching—from plain round and regularly shaped holes to irregular shapes and all types of splines. External broaching examples are classified according to the general shape of the surface involved. Examples are given for low, medium, and high production rates. The section concludes with a list of "Do's and Don'ts" to be remembered in connection with broaching.

Section 4 is devoted to broaches and is also profusely illustrated. Uses of different broach types are presented, as well as specifications, enabling users to determine broach lengths and machine sizes required for specific jobs of metal removal. The section relating to involute splines is particularly complete, covering 34 pages.

Following the "Broach" section is a section on broaching machines, both standard and special. This section also includes illustrations and descriptions of hydraulic presses produced by Colonial for other than broaching purposes. Broach sharpeners are also covered in this section.

The manual-catalog concludes with a section on "Broaching Accessories," including a discussion, illustrations, and descriptions of broach handling devices, gages, and pullers. Of particular interest in this section is the complete section on fixture design as related to specific broaching jobs and sizes of production runs.

A feature of the manual-catalog is the extensive cross-referencing employed, supplemented by a five-page two-column index at the rear of the book. Due to the high cost of preparation of the volume, distribution is necessarily limited to those in industry who have a specific need for so extensive a coverage of broaching methods and equipment.

"Work Done on the Blanchard." A third edition of its booklet "Work Done on the Blanchard" is announced by The Blanchard Machine Co., 64 State St., Cambridge 39, Mass. This 80-page wire-bound pocket-size booklet presents typical examples of the machining and finishing of flat surfaces by Blanchard grinding. Copy is available free to mechanical executives addressing requests on their company letterheads.

"A Report on Foremanship Attitudes."

The growing interest of foremen in company policies on labor relations is one finding of a survey which the National Foreman's Institute is distributing as "A Report on Foremanship Attitudes." The report stresses that when foremen were asked what improvements they thought would be of mutual benefit to themselves and their employers, 55 per cent of those replying said they needed classification of their responsibility and authority, and 41 per cent wanted to learn the principles of personnel relations.

Copy of the 8-page report can be obtained without charge by writing to the National Foremen's Institute, Inc., 10 High St., Deep River, Connecticut.

Stuart "Cutting Fluids and Coolants"

Technical Bulletin No. 5. The newest addition to Stuart's illustrated booklet series of technical bulletins, Technical Bulletin No. 5 entitled "Cutting Fluids and Coolants" is a 36-page symposium on cutting fluids as presented at the American Society of Tool Engineers New Era Exposition.

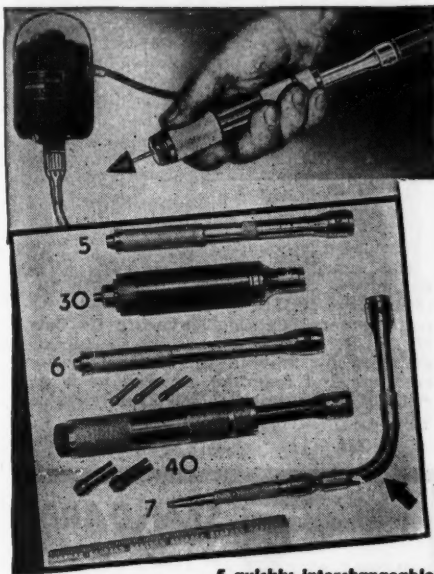
The text consists of four technical papers presented by leading authorities in the cutting fluid field: "What the Tool Engineer Should Know About Cutting Fluids," by W. H. Oldacre, D. A. Stuart Oil Co., Ltd.; "The Testing of Cutting Fluids," by W. J. Wangelin, The Pure Oil Co.; "Cutting Feeds and Speeds," by F. W. Lucht, Carboloy Co., Inc., and "The Selection of Cutting Fluids," by Joseph Geschell, Chilton Publications.

Free copies of Technical Bulletin No. 5 and copies of preceding Technical Bulletins are available upon request. Write to D. A. Stuart Oil Co., Ltd., 2741½ South Troy Street, Chicago 23, Illinois.

Holcroft Gas Carburizing Furnaces for the mass-production industries are featured in a four-page bulletin announced by Holcroft & Co., 6545 Epworth Blvd., Detroit 10, Mich. The bulletin briefly describes the controlled-atmosphere gas carburizing process and outlines its inherent advantages. Numerous possible furnace design features are listed, and an outline is given of the Holcroft procedure of designing each furnace individually for its specific application. Finally, typical Holcroft mass-production gas carburizing installations are illustrated and described. Copy of bulletin free upon request.

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Write for Catalog No. 51

FOREDOM ELECTRIC CO.

27 PARK PLACE NEW YORK 7, N. Y.

"Fully Automatic Die Casting with the Work Horse" is the title of a six-page booklet describing its fully automatic high speed die-casting machine which has been released by Light Metal Machinery, Inc., 736 Penton Bldg., Cleveland 13, Ohio. Sequence photographs of this zinc, lead, and tin die-casting machine illustrate how its cycling mechanism provides for automatic die movement, shot and ejection in continuously repetitive cycles. In addition, typical castings produced with the machine are illustrated.

One page of the booklet is devoted to complete specifications of the machine, including weight, dimensions, plunger diameter, air pressure, and so on. Copy free upon request.

Blanchard Surface Grinders. The Blanchard Machine Co., 64 State St., Cambridge 39, Mass., has prepared a 12-page general catalog covering its Nos. 11, 18, 27, 16-A Dual, and 16-A2 surface grinders for machining flat surfaces on castings and forgings, as well as a variety of other work. Copy free upon request.



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OTHER STYLES AND SIZES IN NEW
MANUAL ON FINISHING—WRITE TODAY

WALLS SALES CORP.
306 E. 38th St., New York 16, N. Y.

Nugent Filters. Wm. W. Nugent & Co., Inc., 410 N. Hermitage Ave., Chicago, Ill., is now offering a bulletin covering the use of both pressure and gravity filters for coolants and cutting oils. Directed to both manufacturers and users of all types of machine tools, the bulletin describes ways and means for conserving oils, as well as for protecting cutting tools against excessive wear. Copy free upon request.

Tri-Bit Cutter Manual. Published by Weddell Tools, Inc., Rochester, N. Y., is a 28-page manual which presents illustrations, descriptions, and tables regarding carbide-tipped face and hyper mills; standard and super face mills; side or straddle mills; special tri-bit mills; arbors; face mill mountings; grinding holders; standard and special fly cutters; flywheel arbors and adaptors; standard and special boring bars; expansion boring bars; hollow mills; and special tools. Data on speeds and feeds, cutter angles and grinds, and maintenance are also provided. Copy of Catalog No. 46 free to mechanical executives upon request.

Ex-Cell-O Hydraulic Power Units. A 16-page bulletin containing engineering information, installation drawings, and application photographs of three sizes of Ex-Cell-O Hydraulic Power Units for feeding and rotating cutting tools has been published by the Ex-Cell-O Corp., Oakman Blvd., Detroit 6, Mich. General information is presented on the use of these units in building special-purpose production machines, as well as specifications and feature details of each unit. Complete particulars are provided on the Ex-Cell-O Style 20 Hydraulic Power Unit (15 1/4 inches overall length)—a small compact unit for high spindle speeds and fast cycles. Copy of Bulletin 45361 free upon request.

Bellows Air Motors. Operations involving pulling, pushing, or lifting are recommended for the Bellow Air Motors featured in an eight-page bulletin published by the Bellows Senacore Co., 798 N. Main St., Akron 10, Ohio. Complete data on the construction features and dimensions of the units are presented, together with information on other Bellows controlled-air power units, including feeds, vises, and collet fixtures. Copy free upon request.

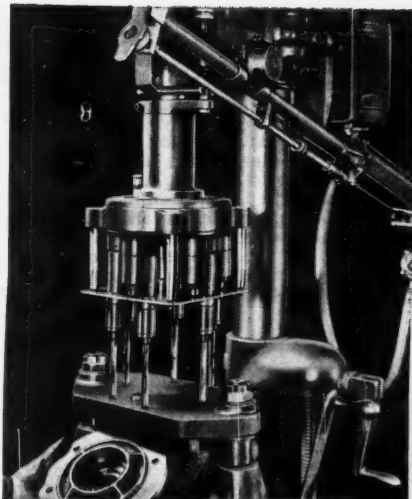
Packaging Materials. The Protective Coatings Corp., 689 Main St., Belleville 9, N. J., has issued a 16-page 8½ x 11-inch brochure on its various products for the protection of packaged products in transit or storage. Described are Aquastop (two types); M-V-Var; Antaqua waterproofing coating; and Plasti Peel for protecting metal parts with a unique, peelable plastic coating. Numerous charts and illustrations interpret physical characteristics and procedures; the application of Aquastop as case panels or prefabricated bags; and the methods of sealing to provide a completely waterproof package. Results of tests made by the manufacturer and users of the several materials are described in detail as are the methods of application in a number of forms to a wide variety of end products.

Also described in the brochure is an interesting seven-week test of the waterproof qualities of Aquastop which was made in the salty, brackish waters of the Passaic River. Copy of brochure free upon request.

"Precision in Millionths" is the title of an eight-page illustrated bulletin issued by the Fonda Gage Co., Stamford, Conn., which describes Fonda Lifetime-Carbide Gage Blocks and Fonda Ultra-Finish Steel Gage Blocks. The bulletin discusses the subjects of toughness, expansion, wear resistance, accuracy, surface finish, corrosion resistance, stability, and wringability of both the Lifetime-Carbide and steel blocks.

Complete price lists are provided for Fonda individual steel gage blocks in standard inch sizes, standard metric sizes, and for sets of gage blocks ranging from a six-piece set to an 84-piece set which permits over 480,000 measurement combinations. A complete listing of the sizes and number of pieces in each steel and Lifetime-Carbide set is given, as well as details on processing, wear-blocks, certification, inspection, and other details. Copy of Bulletin 46-P free upon request.

Troyke Cam Locking Type Rotary Tables especially designed for diesinking and assembly operations are pictured and described in a four-page catalog now being distributed by the Troyke Mfg. Co., 4422 Appleton St., Cincinnati 9, Ohio. Specifications of the various models are included, as well as brief information on wormwheel-operated rotary tables. Copy of Catalog No. 11 free upon request.



Precision Set-Ups That "Stay Put" for

HIGH VOLUME, MULTIPLE DRILLING AND TAPPING

The Quick-Change Adjustable, Multiple Drill Head is designed for long-run, multiple drilling and tapping operations. Illustration shows six holes for a bolt circle being drilled in a cast iron bearing plate. Six different bearing plates are drilled with this head at Wisconsin Motor Corp.

Each bolt circle pattern has its own set of spindle positioning plates. Spindle locked into position; cannot shift. Each spindle can be located anywhere within a 3¼" circle, and all circles overlap.

Standard models available with 2 to 6 spindles. Models with more than six spindles built to order.

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M.S.A. Carbon Monoxide Alarm, product of the Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa., is the subject of a four-page illustrated bulletin published by this firm. In addition to fully describing the alarm and its applications around blast furnaces, in steel mills and chemical plants, and so on, the bulletin also contains a complete description of the M.S.A. Carbon Monoxide Ventilation Control, an instrument designed to control carbon monoxide in ventilating systems with maximum economy and efficiency. Copy of Bulletin DR-3 free upon request.

Williams Machinists' Tools. A 36-page bulletin illustrating and describing Williams postwar line of machinists' tools, including open-end wrenches, torque wrenches, socket wrenches, toolholders, lathe dogs, C-clamps, pipe vises, and so on, is now being issued by J. H. Williams & Co., Buffalo 7, N. Y. Copy free upon request.

Sturdy Precision Gages. A four-page catalog released by the Sturdy Tool & Gage Co., 14520 Schaefer Highway, Detroit 27, Mich., illustrates and describes steel, chrome plated, tungsten carbide, and Norbide precision gages, including various types of ring gages, plug gages, and snap gages. Copy free upon request.

W&B Tool Catalog No. 100. Of the Box-Bak, wire binding type which allows it to lie flat when opened, a 202-page tool catalog having a cellophane laminated cover is announced by Whitman & Barnes, 2108 W. Fort St., Detroit 16, Mich. Printed in clear legible type, the catalog presents information on the complete line of tools manufactured by the company, including heavy duty taper shank drills; straight and taper shank extra length drills; straight shank taper length wire gauge and letter size drills; micro-precision and watchmakers' (flat) drills; short length screw machine drills; straight shank oilhole drills; high speed spotting and centering drills; aircraft body drills; drill sets; high speed hardened and ground drill blanks; carbide-tipped chucking reamers; high speed taper reamers for drill sockets; locomotive reamers; and straight shank interchangeable counterbores and sets.

The catalog also contains helpful information pertaining to the design, construction, use, and care of drills and reamers. Copy is available free to mechanical executives addressing requests on their company letterheads.

Blanchard Surface Grinding Wheels. The Blanchard Machine Co., 64 State St., Cambridge 39, Mass., has prepared a 20-page booklet containing complete descriptive, illustrated, and tabular information on cylinder, sectored, and segment type grinding wheels for Nos. 10, 11, 16, 18, 16-A, 16-A Dual, 16-A2, and 27 Blanchard Surface Grinders. Typical setups and applications of the various wheels are treated. Copy free upon request.

"Grits and Grinds" Volume 37. No. 9. This issue of the Norton technical house organ features illustrated and descriptive information on the development of Norton 32 Alundum—and aluminum oxide abrasive—and its use in surface grinding, internal grinding, toolroom grinding, and foundry grinding operations. Copy is available free by writing to the Norton Co., Worcester 6, Massachusetts.



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Standard Size Dowel Pins from 1/8" to 1" diameter and from 3/4" to 6" length supplied in .0002 and .001 over basic sizes. Unless otherwise specified, .0002 oversize will be furnished.

Dealer inquiries invited.

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109 EDISON PLACE NEWARK 5, N. J.

Progressive Seam Welders. An eight-page two-color bulletin presenting information on the design, operation, and applications of its improved standard and special seam welders has been made available by the Progressive Welder Co., 3650 E. Outer Drive, Detroit 12, Mich. Typical applications of standard seam welders pictured include the welding of a cylindrical cup to a flat circular plate; welding gas tanks; and welding 22 gauge steel tubes at 15 feet per minute. A dual-duplex seam welder with an indexing table that welds two seams, indexes, and makes another pair of seams of different widths is also shown. Copy of Bulletin No. 803 free upon request.

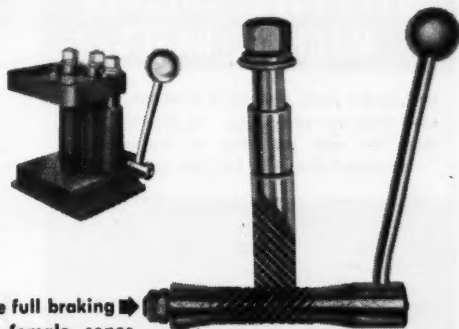
"Whistleclean," an all-purpose industrial cleaner and detergent, is the subject of a six-page illustrated folder released by the American Oil & Disinfectant Corp., 88 Lexington Ave., New York 16, N. Y. The folder describes the effectiveness of the product in cleaning wood and concrete floors, tile, marble and terrazzo surfaces, metal equipment and machinery, and so on. In addition to explaining its detergent qualities, the

folder contains laboratory test data on the bactericidal efficiency of Whistleclean in concentrations as low as one ounce per gallon. Practical cleaning tips on the use of Whistleclean are also included in the folder, copy of which is available free upon request.

"Stop Down Time and Expensive Repairs," a four-page folder issued by the Honan-Crane Corp., 682 Wabash St., Lebanon, Ind., is intended to point out to operators ways in which to stop down time and expensive repairs on hydraulic presses, machine tools, plastic molding presses and machines, die-casting presses, balers, and injection molding machines by the effective purification of hydraulic oils. The folder discusses first the common forms of contamination which cause hydraulic equipment to operate inefficiently and reasons for the presence of such contamination in the oil. Following this is an explanation of Honan-Crane oil purification and what it accomplishes in the way of removing all forms of contamination from hydraulic oils. Types of purifiers available and typical installations are illustrated. Copy of folder free upon request.

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The Woodworth "CONE-LOK" jig utilizes the full braking power of its perfectly mated male and female cones.

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Allis-Chalmers Direct Current Remote Indication and Control Systems are explained simply and concisely in a 12-page engineering bulletin released by the Allis-Chalmers Mfg. Co., 686, Milwaukee 1, Wis. How the transmitter, receiver, and indicator of such systems are constructed, how they work, and their important advantages and specifications are graphically presented with the aid of photographs, diagrams, and charts. Copy of Bulletin 14B6641 free upon request.

"Dustkops Stop Dust and Lint from Polishing and Buffing," a bulletin containing suggestions on installing individual dust collectors for collecting dust, lint, and rouge originating from polishing, buffing, and metal coloring operations, is now being offered by the Agat-Detroit Co., 602 First National Bldg., Ann Arbor, Mich. The bulletin includes illustrations of typical installations of Dustkop dust collectors and dimensions and prices of the Model 1150 Dustkop unit. Copy of Bulletin No. 392 free upon request.

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Littleford's plate and sheet steel fabrications save high cost of castings and molds. Choose them for new machines or replacements. Send us blueprints for free estimate.



Jeon Automatic Angle Tangent to Radius Dresser, product of the Jeon Manufacturing Co., P. O. Box 6750, Washington 20, D. C., is described as to operation, application, features, and capacities in a four-page illustrated folder published by this firm. Copy free upon request.

"Induction Heating" is the title of a 59-page bulletin prepared by the Tocco Division, The Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland 1, Ohio, covering the general history, principles, and applications of induction heating, as well as dealing specifically with many of the most technical considerations of induction heating. The bulletin is replete with pictures, charts, and graphs, and is available free to executives addressing requests on their company letterheads.

"Buffalo" Non-Clogging Raw Sewage Pumps. Buffalo Pumps, Inc., Buffalo 5, N. Y., now has available a 32-page bulletin presenting complete construction details, dimensions, and installation and operating data on vertical and horizontal sewage pumps, self-priming sewage pumps, sewage ejectors, and single suction sludge pumps for general service and special liquids. Included are typical specifications covering the various pumps. Copy of Bulletin 964-D free.

"Levermatic" Collet Chuck, product of Forst Bros., 259 N. California Ave., Chicago 12, Ill., is fully illustrated and described as to construction features, operating principle, application, dimensions, and specifications in a four-page circular published by this firm. Copy free upon request.

OILY FLOOR TROUBLES stopped with FULLER'S EARTH!

An oil and grease absorbent that replaces sawdust or wood shavings. Lessens fire hazard! Stops accidents due to slipping on oil or grease! Low priced—economical—safe! Write for FREE SAMPLE or ask for trial order at quantity price!

TAMMS SILICA CO.
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"More Power to U. S. A." is the title of a 32-page bulletin released by the Allis-Chalmers Mfg. Co., 709, Milwaukee 1, Wis., which describes and portrays the company's products commonly used in generating, substation, transmission, and distribution system. In brief but concise fashion, the bulletin presents Allis-Chalmers equipment available for power generation and distribution, ranging from steam and hydraulic turbines, turbo generators, engine type generators and condensers, and auxiliaries to pumps, water conditioners, motors, motor controls, switchgear, circuit breakers, power and distribution transformers, and unit substations. Copy of Bulletin 25B6150 free upon request.

Tru-Lay Push-Pull Controls are the subject of a 16-page catalog now being issued by the Automotive and Aircraft Division, American Chain & Cable Co., Inc., Detroit, Mich. The catalog includes pictures, descriptions, and engineering drawings of all types and every variety of Tru-Lay Push-Pull Controls, together with complete application data. Copy free upon request.

Sched-U-Graph. How to obtain maximum production from existing plant facilities is the theme of "Dynamic Management Control with Sched-U-Graph," a 32-page full-color booklet published by Remington Rand Inc. The booklet fully describes the Sched-U-Graph, a unique and practical chart-board application of the time-control principles pioneered by Henry L. Gantt.

Profusely illustrated, the booklet demonstrates the operating and control advantages of Sched-U-Graph as applied to the loading and scheduling of machines, men, or work centers; part orders and operations; scheduling of production of sub-assemblies; inventory control of parts for line assembly; scheduling continuous production by operations; scheduling actual against required production with visual indication of leads and lags; and sales progress against sales and profit contribution quotas by branch offices of salesmen on a time or percentage attainment basis.

Copies of the booklet may be obtained without cost from any branch office of Remington Rand Inc. or by writing to the Systems and Methods Research Dept., Systems Div., Remington Rand Inc., 315 Fourth Ave., New York 10, N. Y.



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Foxboro Pneumatic Control Valves and Controller Accessories are the subject of a 36-page bulletin announced by The Foxboro Co., Foxboro, Mass. Features include a color page showing the various identifying enamel finishes offered on Stabilflo Valves, corresponding with the color code of the American Standards Association; plates and tables of specifications for control valves, needle type valves, poppet valves, and butterfly valves; separate sections on the Vernier Valvactor for the high-accuracy positioning of valve plungers, and on air switches and sub-panels for remote valve control. An appendix contains information for computing valve sizes, with tables and formulas provided for determining the size of the correct valve for a contemplated installation. Air filter sets, ventilating dampers, and other pertinent accessory equipment are illustrated and described on other pages. Copy of Bulletin 277-1 free upon request.

"Sunicut 11," a sulphurized cutting oil for automatic machines, is the subject of an illustrated four-page performance data folder published by the Sun Oil Co., Industrial Products Dept., Philadelphia 3, Pa. Copy free upon request.

Griffin Hack Saw Blades and Band Saw Blades are the subject of a 4 x 8 1/2-inch 20-page price list distributed by John H. Graham & Co., Inc., 105 Duane St., New York 8, N. Y. The price list covers power machine and hand frame type hack saw blades and metal-cutting and wood-cutting band saw blades. Tables giving standard blade lengths for band saw machines and recommended pitch and speed for cutting various materials with band saws are included. Copy free upon request.

"Your Man Friday," a six-page folder describing the Stevedore, Jr., power belt conveyor, has been issued by The Rapids-Standard Co., Inc., Dept SB-176, 308 Peoples National Bank Bldg., Grand Rapids 2, Mich. The folder includes descriptions and illustrations of all latest developments on the conveyor and presents typical installation photographs of the Stevedore, Jr., in industry. A two-page spread describes construction details and other features of the conveyor, and the back page of the folder shows additional Rapids-Standard material handling equipment in various installations. Copy of the folder is available free by requesting Form SJA-46-6.

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Hardinge Draw-In Collets for all lathes and millers are conveniently tabulated in a four-page illustrated bulletin released by Hardinge Brothers, Inc., Elmira, N. Y. Designed to simplify collet ordering, the bulletin also includes information on the Hardinge-Sjogren Speed Collet Chuck for toolroom and engine lathes. Copy of Bulletin No. 46 free.

Moline Machine Tool Catalog. Published by the Moline Tool Co., Moline, Ill., this catalog comprises a series of bulletins presenting illustrated, descriptive, and tabular information on the various machine tools and equipment produced by the company, including drill heads, production drillers, cylinder borers, precision boring machines, automatic retracting boring heads, honing machines, hones, way type and vertical drilling, boring, reaming and tapping machines, horizontal drilling and boring machines, and so on.

Copy is available free to mechanical executives addressing requests on their company letterheads.

"Radiac" Cut-Off Machines for both wet and dry cutting are covered as to construction features, advantages, available types, applications, and specifications in a 24-page pocket-size illustrated folder now being distributed by A. P. De Sanno & Son, Inc., 112 S. 16th St., Room 816, Philadelphia, Pa. "Radiac" Abrasive Cut-Off Discs are also treated. Copy free.

Foxboro Model 40 Controller. Bulletin 381 now being distributed by The Foxboro Co., Foxboro, Mass., describes the Model 40 Controller, newest addition to the company's line of instruments for process control. Large illustrations, accompanied by appropriate text, depict the many design features of the unit. Indicating models, as well as single and multiple-pen recorders, are shown, and the five types of control action available in the Model 40 are explained. Copy free.

Woods Improved Model "40" Belt Sander for operations on metals, plastics, and other materials, including tool grinding, deburring, and finishing applications, is illustrated and described in Catalog Sheet 46-1 now being offered free by the Woods Engineering Co., Norwalk, Connecticut.



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Farrel Gearflex Couplings. A 46-page bulletin which completely describes various types of couplings for use in industrial and marine service is now being offered by the Farrel-Birmingham Co., Inc., Ansonia, Conn. Designated as the No. 447, the bulletin, with the aid of many photographs, drawings and installation illustrations, provides a clear description of coupling functions, plus recommendations of the correct types for specific applications. Also included are complete engineering data relative to ratings, dimensions, and weights. Copy of Bulletin No. 47 free.



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"Tenite Injection Molding" is the title of a 36-page booklet published by the Tennessee Eastman Corp., Kingsport, Tenn., for the express use of injection molders and prospective manufacturers of molded products of its thermoplastics, Tenite I and Tenite II. The booklet deals with all aspects of the injection-molding process, including the choice of material of the proper flow and hardness; preparation of the material molding; proper design of the product to be molded; mold design and construction; and the various methods of finishing. Problems and practices connected with each are discussed at length, with special attention given to those pertaining to the design and construction of molds.

The booklet is illustrated with cross-section drawings of several of the operations in general use in injection molding, and provides five examples of typical molded designs. Accompanying these illustrations are full descriptions of the mold, the machine used, and the operation of the mold. A handy index of molding terms and a list of some of the problems encountered in molding are also included in the booklet, copy of which is available free to mechanical executives addressing requests on their company letterheads.

De-Sta-Co Toggle Clamps are the subject of a 32-page catalog issued by the Detroit Stamping Co., Dept. K, 439 Midland Ave., Detroit 3, Mich. Of interest to machinists, tool and production engineers, and others whose problems include the holding of parts in production, the catalog contains detailed specifications of the entire clamp line, as well as many application illustrations. A section is devoted to data on arbor spacers, shims, shim and feeler stock, and miscellaneous job stampings. Copy of catalog No. 47 free upon request.

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"Surface" Prepared Atmosphere Roller Hearth Furnaces for ferrous and non-ferrous bars, tube, and strip are described in a four-page bulletin now being issued by the Surface Combustion Corp., Toledo 1, Ohio. Characteristics, advantages, and features of the furnaces are explained, and furnace operating data are provided. Copy of Bulletin No. SC-132 free upon request.

Union "Direct Mounting" Chucks, both independent and geared scroll types, are illustrated and described, as well as covered as to dimensions and prices, in a bulletin now being offered free by the Union Manufacturing Co., New Britain, Connecticut.

Chicago-Latrobe Carbide Tipped Masonry Drills for rapid and efficient drilling in all non-metallic materials such as brick, cement, marble, slate, concrete, tile, stone and glass are featured in a circular with prices now being distributed by the Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago 10, Ill. Copy free upon request.

Airco Welding and Cutting Products are featured in a 64-page general catalog published by the Air Reduction Sales Co., 60 W. 42nd St., New York 17, N. Y. Profusely illustrated, the catalog is divided into two sections—one for oxyacetylene welding and cutting gases, equipment, and supplies, and the other for arc welding machines, accessories, and electrodes. The last 10 pages of the catalog are devoted to specially compiled electrode price lists.

Copy of the catalog can be obtained free of charge by individuals addressing requests on their company letterheads.

"Speaking of Preformed" is the title of a 20-page booklet which contains in condensed and charted form the results of an extensive survey made by the Preformed Wire Rope Information Bureau using a questionnaire presenting 10 questions relative to the use, performance, and value of preformed wire rope. Copy of the booklet can be obtained free of charge by writing to the Preformed Wire Rope Information Bureau, 520 N. Michigan Ave., Chicago 11, Illinois.

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"Steel Mill Lubrication," a 16-page pocket-size booklet dealing with centralized lubrication systems as applied to blooming mill operation, has been published by the Lubricants Dept., Shell Oil Co., Inc., 50 W. 50th St., New York 20, N. Y. It is one of a series of booklets in Shell's "Facts That Help" group which describes lubrication problems encountered in various industries.

"Steel Mill Lubrication" summarizes the characteristics a lubricant must possess in order to lubricate all of the bearings of a blooming mill properly. It features the operation of the blooming mill since this mill typifies many of the lubrication requirements of the steel industry. Copy free upon request.

Sonntag Model SF-10R Rotating Beam Fatigue Testing Machine, which is said to produce a constant bending movement from 0 to 10,000 inch-pounds on round specimen as large as 1 inch in diameter, is covered as to specifications and details in Bulletin 205 now available free from the Baldwin Locomotive Works, Philadelphia 42, Pennsylvania.

Lima Gearshift Drives for all types of new or used machine tools or production equipment are illustrated and described in a six-page bulletin published by The Lima Electric Motor Co., Lima, Ohio. Other products covered include electric motors, pedestal grinders, and polishing and buffing lathes. Copy free.

"A Better Kind of Lighting" is the title of a 4-page bulletin issued by the Lustra Corporation of America, 40 W. 25th St., New York 10, N. Y., which illustrates and describes 9 types of reflector lamps for industrial, commercial, and display lighting. Copy of Bulletin No. 101 free upon request.

Unitables. An 8½ x 11-inch two-color eight-page bulletin featuring an all-purpose conveyor-mechanized work table for assembly, inspection, and packing operations has been issued by the Island Equipment Corp., 101 Park Ave., New York 17, N. Y. The bulletin is profusely illustrated with installations, cross-sections, and parts of the equipment. Copy of Bulletin PF-8 free upon request.

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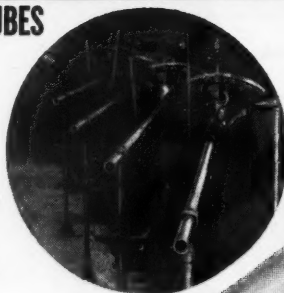
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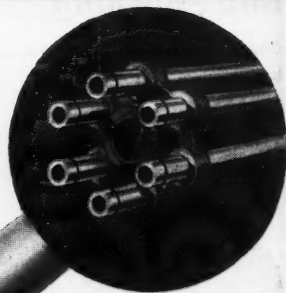
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Newcomb-Detroit Spray Booths. A 16-page catalog describing its water tube spray booth has been published by the Newcomb-Detroit Co., 5741 Russell St., Detroit 11, Mich. The catalog covers the working principle and presents complete specifications of this paint spray booth. The descriptive matter is supplemented by numerous photographs and drawings, including installation views. Copy free upon request.

"A Gem" is the title of a four-page bulletin issued by Allied Machinists of Waltham, 6 Water St., Waltham, Mass., which illustrates and describes the Gem-Flex Wheel and Tool Dressing Fixture and its use in radii dressing, angle dressing, positional grinding, complex drilling, surface gaging, and various other operations. Copy free upon request.

Flame Cutting. Joseph T. Ryerson & Son, Inc., Box 8000-A, Chicago 80, Ill., has issued a four-page illustrated bulletin on flame cutting which describes the company's facilities for producing plain and intricate shapes from steel plates. A number of typical flame cut sections are presented, together with information regarding the use of irregularly shaped steel plates in both production and maintenance work. Copy free upon request.

Sciaky Flash-Butt Welding Machines for mild steels, alloys steels, aluminum, and other non-ferrous metals and alloys are featured in a 30-page bulletin published by Sciaky Bros., Inc., 4915 W. 67th St., Chicago 38, Ill. The bulletin begins with a discussion of the principles of flash-butt welding and then illustrates and describes in complete detail the design features of the various Sciaky Flash-Butt Welders. Specifications and diagrams of the various models are included. Copy of Bulletin 130-A free upon request.

Metzgar Materials Handling Equipment. The Metzgar Co., Grand Rapids 4, Mich., now has available a six-page folder which illustrates and briefly describes its complete line of materials handling equipment, including gravity wheel and roller conveyors, endless belt "power helpers," endwood truck and trailer wheels, end-wood wheel casters, and cable reel dollies. Copy free.

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"Universal" Retractable Knurling Tool, especially designed for difficult knurling jobs and adaptable to any engine or turret lathe, is featured in a four-page two-color 8½ x 11-inch folder published by the Universal Vise and Tool Co., Parma, Mich. Copy free upon request.

Heavy Duty Multiple Arm Relays are described and illustrated in a four-page bulletin now being issued by the Signal Engineering & Mfg. Co., 163 W. 14th St., New York 11, N. Y. Data are presented regarding basic design features, contact ratings, circuit arrangements, and so on. Copy of Bulletin No. 30 free.

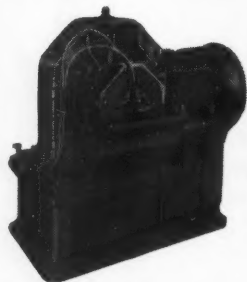
"The Inside Story of Trico Renewable Fuses" is the title of a 24-page pocket-size booklet published by the Trico Fuse Mfg. Co., 2948 N. 5th St., Milwaukee 12, Wis. Profusely illustrated with drawings and charts showing in detail the advantage of the "powder-packed" principle in renewable fuse design, the booklet contains helpful information for increasing production by eliminating unnecessary shutdowns. Copy of Booklet No. 206-A free upon request.

Dayton Rogers Hydraulic Overload Pitman for Punch Presses is the subject of a four-page illustrated bulletin released by the Dayton Rogers Manufacturing Co., 2835 12th Ave. S., Minneapolis 7, Minn. Information regarding specifications, features, operation, and dimensions of the unit are included. Copy free upon request.

Dillon Mechanical Pressure Gage. W. C. Dillon Co., Inc., 5410 W. Harrison St., Chicago 44, Ill., now has available an illustrated bulletin describing its mechanical pressure gage for the accurate indication of pressures or working loads in mechanical assemblies. Specifications and prices are included in the bulletin, copy of which is available free.

Valvair Air Control Valves. A four-page folder published by the Valvair Corp., 454 Morgan Ave., Akron 11, Ohio, illustrates many of the designs and types of air control valves now being produced by this firm, including knob, lever, foot, cam, clevis, single diaphragm, double diaphragm, single solenoid, and double solenoid actuated valves. Copy free.

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"The What, When, Why, and How of 'Cocoon' Protective Packaging" is the title of a 12-page booklet prepared by the Coatings Division, R. M. Hollingshead Corp., Camden, N. J., which fully covers a unique packaging plastic consisting of modified film-forming vinyl resins carried in volatile solvents for protecting metal items, ranging from ball bearings to locomotives, from the elements. Copy is available free by requesting Form No. 5559.

Drill Feed and Speed Chart. In answer to requests from users of twist drills for recommended speeds and feeds in the different classes of material, the Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago 10, Ill., has prepared a chart entitled "Safe Feeds and Speeds for High Speed Drills." Copy free.

"Universal" Precision Radius Dresser for producing convex, concave, and compound radii from 0 to 1 inch on wheels up to 7 inches in diameter is the subject of a four-page two-color 8½ x 11-inch illustrated folder now available free from the Universal Vise and Tool Co., Parma, Michigan.

"Sun 'Job-Proved' Products for Industry" is the title of a four-page illustrated folder published by the Sun Oil Co., Industrial Products Dept., Philadelphia 3, Pa., which describes cutting oils, textile and rubber processing oils, general lubricants, refrigeration oils, mine lubricants, Diesel oils, solvents, greases, and waxes. Copy free upon request.

W & B Carbide-Tipped Masonry Drills. A four-page circular published by Whitman & Barnes, 2108 W. Fort St., Detroit 16, Mich., lists and illustrates carbide-tipped masonry drills for the quick and easy drilling of concrete, cement, brick, slate, marble, stone, and all types of masonry materials. Copy free.

Sta-Ga-Co Rotary Grinding Attachment for installation on surface grinders in grinding bushings, punches, step studs, slots, radii, plug gages, and so on, is fully illustrated and described in a four-page folder now being distributed by the Gale Forssen Co., 64 Monmouth St., Springfield 9, Mass. Copy free upon request.

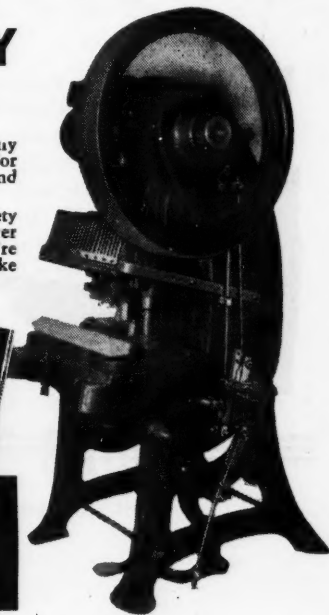
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Torrington Bearing Manual No. 15. The Torrington Co., Bantam Bearings Div., South Bend 21, Ind., announces the publication of a 168-page manual containing engineering and application data on ball radial, ball reciprocating, radial roller, taper roller, and thrust bearings. Designated as the No. 15, the manual completes a series of three volumes published by the company to provide full bearing engineering data and, at the same time, to furnish an authoritative guide in the proper selection of suitable anti-friction bearings for all types of applications. An attractive leatherette ring binder is pro-

vided with the manual in order that executives can combine the three volumes and thus have at their finger tips a handily indexed and complete reference work of anti-friction bearing information.

Copy of the manual, together with the leatherette ring binder to accommodate the other volumes in the series, will be forwarded to authorized engineering executives addressing requests on their company letterheads.

Chain Hoist Bulletin. Chester Hoist Company, Lisbon, Ohio, has issued a 16-page, 8½ x 11-inch bulletin in two colors covering this firm's complete line of Spur-Geared (High Speed) and Differential Chain Hoists, together with their Army Type Low Headroom Timken-Equipped Trolley Hoists. The Bulletin also contains tables and section and photographic views of the products, including view of a complete line of I-beam trolleys. A copy of the Bulletin is available to any plant executive who will request it on his firm's letterhead.

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A positive displacement unit for liquids having lubricating properties, water, coolants, chemicals, gasoline, hydraulic, etc.

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"Secret of Sol-Speedi-Dri Leadership" is the title of a six-page folder now being distributed by the Waverly Petroleum Products Co., Drexel Bldg., Philadelphia 6, Pa. The folder contains specific facts and pictures regarding the various steps involved in the production of Sol-Speedi-Dri absorbent for industrial housekeeping. Copy free upon request.

Diebel Automatic Hi-Speed Press for the economical production of small stampings is fully described as to construction features, operation, application, and so on, in a four-page illustrated circular published by the Di Machine Corp., 2711 Irving Park Rd., Chicago 18, Ill. Copy free upon request.

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Motorized HydroElectric Lift Truck, product of Lift Trucks, Inc., 2425 Spring Grove Ave., Cincinnati 14, Ohio, is featured in a six-page catalog published by this firm. Detailed diagrams illustrate the mechanical structure and dimensional specifications of the truck. Additional information concerning the unit, including illustrations showing how the truck can be used to reduce operation and maintenance costs, is provided in the catalog, copy of which is available free upon request.

"**Liquid Carburizing**" is the title of an article by R. S. Komarnitsky which is now being distributed in reprint form by the Ajax Electric Co., Inc., Frankford Ave. at Delaware, Philadelphia 23, Pa. The article covers all phases of liquid carburizing, including technical aspects and economics, as compared with other types of carburizing. Copy free.

Barker Wrenchless Chucks and Drill Press Vises are the subject of a six-page illustrated bulletin published by the Thomas Hoist Co., 20 S. Hoyne Ave.,

Chicago 12, Ill. Specifications on two and three-jaw chucks for turret and engine lathes and semi-automatic pipe threading and cutting-off machines, as well as on two and three-jaw drill press vises, are included. Copy of Bulletin No. 201 free upon request.

Thermocouple Lead Wires. The Thermo Electric Co., 22-02 Raphael St., Fair Lawn, N. J., has prepared a four-page catalog section which illustrates and describes its standard lead wires used with all types of pyrometers and thermocouples. Information regarding special lead wires and thermocouple wires is also presented. Copy of Catalog Section No. 30 free upon request.

Genesee Facing and Counterboring Tools. A four-page bulletin published by the Genesee Manufacturing Co., Inc., Rochester, N. Y., contains illustrated descriptive, and tabular data, including prices, on the Genesee Style H and F Inserted-Blade Facing and Counterboring Tools for heavy cuts and light finishing cuts respectively. Copy of Bulletin HF344 free upon request.

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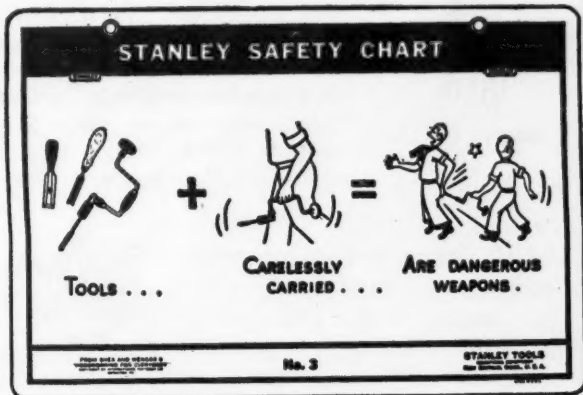
It is suggested that one or two of the Charts be displayed on the safety

bulletin board or elsewhere in the Plant each week. In this way one set of the Charts can be used for several months or more without duplication.

Stanley Safety Charts are offered to industrial plants at the cost of printing and postage; \$2.50 per set anywhere in the U. S. A. (Canadian price is \$4.10 per set, payable in Canadian funds). Check for proper amount should be mailed with order to Stanley Tools, Educational Department, New Britain, Conn.

Robbins Index Table for fast, accurate indexing on production operations is the subject of a six-page bulletin now being issued by the Robbins Engineering Co., 318 Midland Ave., Detroit 3, Mich. The complete details of the construction and operation of the unit are amplified by a large cutaway photograph on which all parts are clearly marked and defined. Specifications and dimensions of the three sizes available are also included. Copy free upon request.

"How, Why, and Where of Lock Washers" is the title of a 20-page technical booklet released by the George K. Garrett Co., 1421 Chestnut St., Philadelphia 2, Pa. One of the many interesting points in the booklet is the discussion of the "Constant Power Zone" of the spring lock washer and its comparative merits with other fastening devices. In addition, the booklet contains full specifications on all sizes of spring lock washers. Copy free to purchasing agents, design engineers, and production men.



Replica of Typical Stanley Safety Chart

M.S.A. Hose Masks. The Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa., now has available a six-page bulletin containing complete information, including construction and operation details and industrial applications, on M.S.A. Hose Masks and auxiliary equipment designed to safeguard workmen where high concentrations of gas or insufficient quantities of oxygen exist, such as in tanks, tank cars, tank ships, ship holds, vats, in street and plant work, around blast furnaces, and in similar confined areas. Also featured in the bulletin are hand and motor-operated air blowers. Copy of Bulletin No. EB-5 free upon request.

"Off the Shelf Service" is a feature of a general catalog now being issued by the Patron Transmission Co., 120 Grand St., New York, N. Y., which contains complete descriptions, data, and prices on speed reducers, gears, belts, chain drives, bearings, flexible couplings, pulleys, electrical motors, power and gravity conveyors, and many other items. Copy free upon request.

"Flexloc" Self-Locking Nuts. A four-page illustrated folder describing the application of "Flexloc" Self-Locking Nuts to textile machinery and also containing a table giving sizes and list prices is now being issued by the Standard Pressed Steel Co., Box 556, Jenkintown, Pennsylvania. Copy free upon request.

Proconier Style "C" Friction Tap Holder. An attractive two-color folder has been released by the Proconier Safety Chuck Co., 18 S. Clinton St., Chicago 6, Ill., which describes in detail the Proconier Style "C" Friction Tap Holder for use on reversible machines. Copy free upon request.

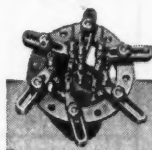
Parker Power Squaring Shears for the shearing and trimming of all types of metal up to 14 gauge are fully covered as to construction features and specifications in a 4-page illustrated folder now being distributed by the Parker Manufacturing Co., 2200 Colorado Ave., Santa Monica, Calif. Copy free upon request.



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Celfor Carbide Cutting Tools and Reamers, product of Celfor Tools, Division of Clark Equipment Co., Buchanan, Mich., are illustrated, described, and tabulated in a six-page bulletin prepared by this firm. Copy free upon request.

Race Portable Base for small machine tools is illustrated and described in a bulletin now available free from Race, Inc., 3010 Hiawatha Dr., Dayton 5, Ohio.

Monarch "Speedi-Matic," a high production hand-operated screw machine, is the subject of a 20-page bulletin published by The Monarch Machine Tool Co., Sidney, Ohio. Considerable space is devoted to the explanation and illustration of the electronically controlled preselection of speeds as featured by the machine, which is designed to handle small machine work in quantities of 25 to 500 or more pieces.

Copy of Bulletin No. 1901, which is printed in two colors, is available free upon request.

Boston Power Transmission Equipment and Component Parts are the subject of a 320-page general catalog announced by the Boston Gear Works, Inc., North Quincy 71, Mass. The catalog contains complete specifications and list prices of all stock sizes of spur gears, bevel gears, miter gears, chain and sprockets, reducers (speed reducers), ratiometers (motorized speed reducers), couplings, collars, pulleys, pillow blocks, shaft supports, ball bearings, universal joints, pinion wire, racks and so on.

Copy of Catalog No. 54 is available free to mechanical executives addressing requests on their company letterheads.

D'Oiler Degreasers. An eight-page bulletin published by the Mechanical Process Co., P. O. Box 88, South Orange, N. J., illustrates and describes D'Oiler Degreasers for the efficient cleaning of metal parts and pieces, including laboratory, two-dip, three-dip, vapor spray, barrel type, automatic and semi-automatic, and special large degreasers for an unusually wide variety of degreasing applications. Copy free upon request.

The advertisement features a large, dark, irregular shape resembling a splash or a cloud. Inside this shape, the word "Spartan" is written in a stylized, cursive font at the top left. Below it, the words "HACK SAWS" and "CUT CUTTING COSTS" are written in a bold, sans-serif font. In the center of the shape, several long, thin, dark lines radiate outwards, resembling the blades of a saw. At the bottom right of the shape, the words "used everywhere!" are written in a cursive font. Below the entire graphic, the text "SPARTAN SAW WORKS, INC." is written in a bold, sans-serif font, followed by "SPRINGFIELD 2, MASSACHUSETTS" in a smaller, sans-serif font.

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21/32"	15	12	8.00	31/32"	15	12	14.00
11/16"	15	12	8.25	1"	20	15	16.00
23/32"	15	12	8.50	1-1/16"	20	15	17.00
3/4"	15	12	8.50	1-1/8"	20	15	18.00
25/32"	15	12	9.50	1-3/16"	20	15	20.00
13/16"	15	12	11.00	1-1/4"	20	15	22.00

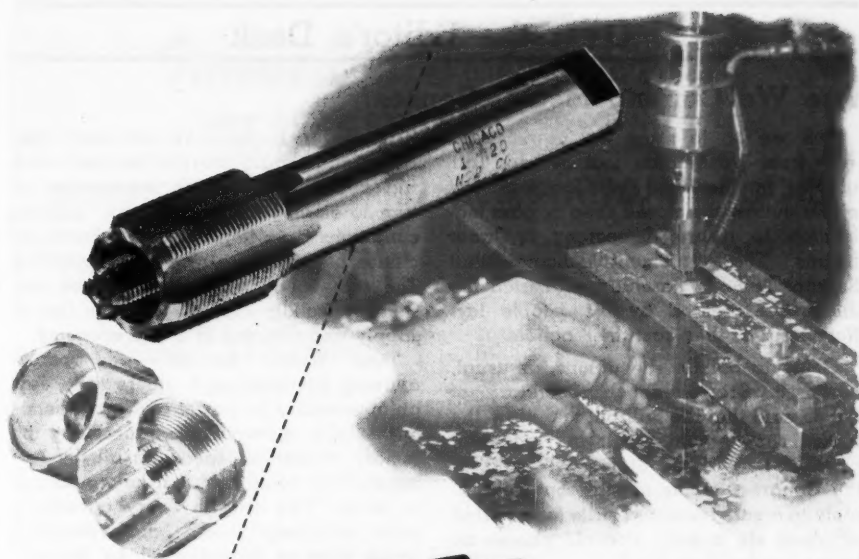
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Bellows Senacon Foto Facts File. A series of case histories regarding the effective use of air in speeding production is now being offered in the form of sheets designated as Foto Facts by the Bellows Senacon Co., 789 N. Main St., Arkon 10, Ohio. Case histories illustrated involve the use of Bellows Senacon Air Motors, "Controlled-Air" Powered Feeds and "Power Dome" Air Cylinder. Copies of the sheets are available free upon request.

Crozier Time-Saving Tools. A 12-page illustrated catalog issued by the Crozier Machine Tool Co., 684 N. Prairie Ave., Hawthorne, Calif., describes the features and operation of Crozier time-saving tools, including various models of the Vacuum-Grip Speed Lathe for odd shaped parts that cannot be held by a chuck or collet; tool post turrets equipped with cutting-off tool and holder; collet attachments; collets, and surface plates. Copy of Catalog 46-1 free upon request.



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require two concentric tapped holes in die-cast aluminum pistons. Originally, these were tapped individually—a 9-second operation for each hole—*18 seconds per piece*.

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In such operations, Besly Taps contribute top accuracy and production economies. Leading American industries depend on them for clean-cut, low-cost threading.

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Over the Editor's Desk

Are We Coming to Our Senses?

AS we go to press the news comes from Washington that Senator Taft, of Ohio, has declared that Congress must either outlaw the closed shop or pass legislation to insure democracy in labor unions. That statement indicates that Senator Taft has carefully evaluated the thinking expressed by the people last November as they cast their ballots.

Going to bat for the unions, as usual, Lewis B. Schwellenbach, Secretary of Labor, said that the Ball bill to outlaw the closed shop would result in "industrial chaos in the United States." He said "If the Congress wants to start out deliberately to create industrial strife for a period of about six months, it could choose no better course than this."

What does Mr. Schwellenbach think we have had for the past five or six years—an industrial picnic? American industry has been the victim of a continuous round of strikes as one union after another sought to obtain an economic advantage by demanding higher and still higher wages—apparently oblivious to the fact that higher wages must of necessity mean higher living costs.

The writer of this editorial worked at the lathe and the boring mill in the days when ten hours was the standard working day and thirty cents an hour was the standard wage for a machinist. In the course of time wages crept up toward the five-dollar a day scale and employers began reducing the working hours toward eight, all of which was made possible by the high productivity of modern high-production machinery and tooling. The mechanics began buying automobiles and in a few years every factory was forced to provide parking spaces for its employees' cars.

Employers began to vie with each other as to who should provide the best working conditions. Factory restaurants began to employ first-class cooks. Lighting conditions were improved. Washroom facilities of the latest type were installed. The scale of living of the workers rose steadily, solidly supported by the law of supply and demand in a free economy.

Then Walter Reuther—an openly avowed Socialist—and others who saw an opportunity for power and prominence in the labor movement began selling the factory worker the idea that all the luxuries of life could be his if he would join a union. Two cars in every garage; a radio in every room; paid vacations; union dues to be collected by the employer at his own expense—and now pay for all the time the worker is on the company's property, regardless of whether that worker is producing anything or not.

We still maintain that the only accurate gauge of what a man is worth in a given job is the law of supply and demand. We still maintain that the only justification for a high wage is high productivity, and that the only honest way to get a high wage is to earn it. Forcing a high wage by holding up production is dishonest and unfair to others; it has the direct effect of lowering someone else's standard of living and ultimately reduces employment through a reduction of demand due to high prices.

It is too much to expect that everyone will be able to realize what is happening, but let us hope that there are enough people with the intelligence and perception to see and understand the implications of the present situation. Intelligence, perception and independent thinking were never so necessary as they are today.

Howard Campbell

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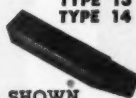
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**TYPE 13
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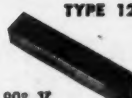
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TYPE 1



**SQUARE
NOSE**

TYPE 12



**80° V
NOSE**

SIZE	TYPE 4 (TR. Right Hand)		TYPE 7 (TL. Left Hand)		TYPE 13 (TR. R. H. Offset)		TYPE 14 (TL. L. H. Offset)		TYPE 1 (Square Nose)		TYPE 12 (80° V Nose)	
	Stock No.	Price	Stock No.	Price	Stock No.	Price	Stock No.	Price	Stock No.	Price	Stock No.	Price
1/4 x 1/4 x 2 1/4"	TR. 41	.84	TL. 71	.84					T. 11	.84		
5/16 x 5/16 x 2 1/4"	TR. 42	.84	TL. 72	.84					T. 12	.84	T. 122	.96
3/8 x 3/8 x 2 1/2"	TR. 43	.90	TL. 73	.90					T. 13	.90	T. 123	1.14
1/2 x 1/2 x 3 1/2"	TR. 45	1.32	TL. 75	1.32	TR. 135	1.32	TL. 145	1.32	T. 15	1.32	T. 125	1.44
5/8 x 5/8 x 4"	TR. 47	1.80	TL. 77	1.80	TR. 137	1.80	TL. 147	1.80	T. 17	1.98	T. 127	2.00
3/4 x 3/4 x 4 1/2"	TR. 48	1.92	TL. 78	1.92	TR. 138	1.92	TL. 148	1.92	T. 18	2.70	T. 128	2.75
1 x 1 x 7"	TR. 406	3.30	TL. 706	3.30	TR. 1306	3.30	TL. 1406	3.30	T. 106	4.00		
1 1/4 x 1 1/4 x 8"	TR. 410	4.65	TL. 710	4.65	TR. 1310	4.65	TL. 1410	4.65	T. 110	5.70		
1 1/2 x 1 x 7"	TR. 401	1.68	TL. 701	1.68	TR. 1301	1.68	TL. 1401	1.68	T. 101	1.80		
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3/8 x 1 1/4 x 8"	TR. 403	2.58	TL. 703	2.58	TR. 1303	2.58	TL. 1403	2.58	T. 103	2.88		
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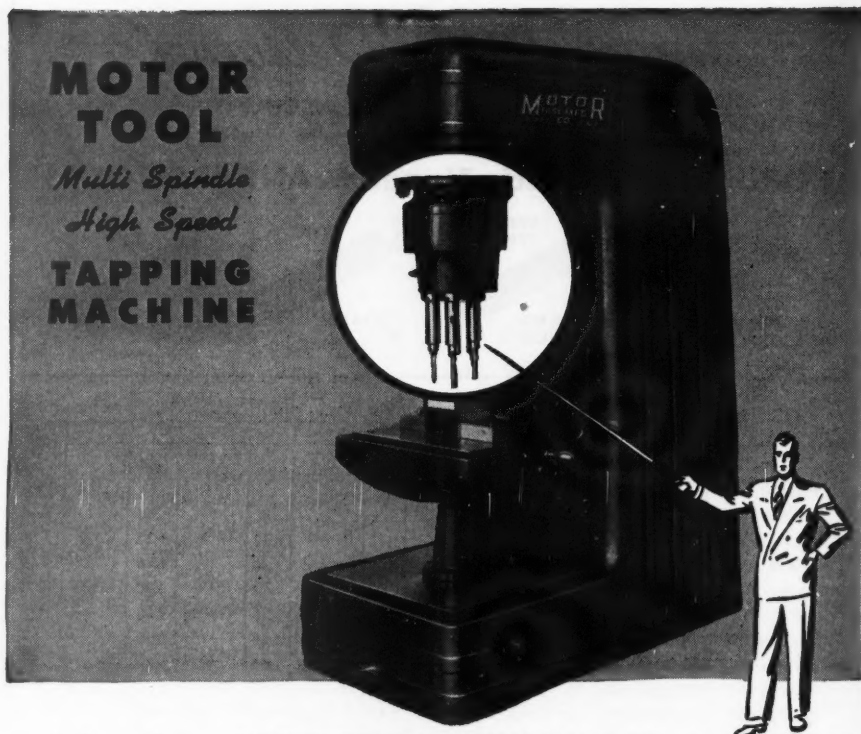
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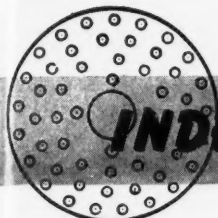
as 1". It will do the work with precision and accuracy. It will do it automatically—at high speed—with one operator in place of many. No expensive outlay for additional machines. No idle machines between jobs. Operator's time is utilized to the utmost. Floor space is conserved. Simple, dependable operation—with assurance of uniform, accurate work.

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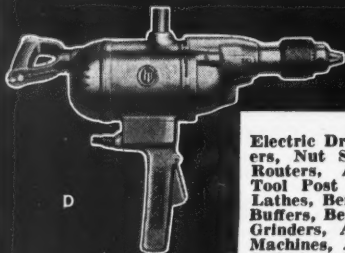
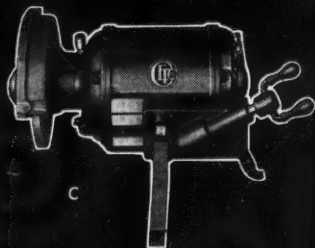
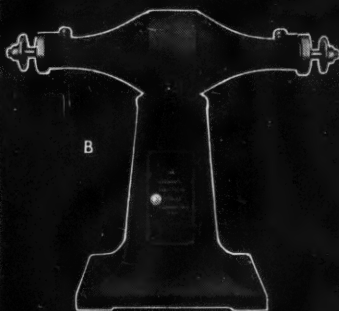
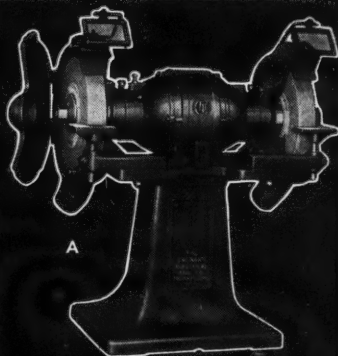
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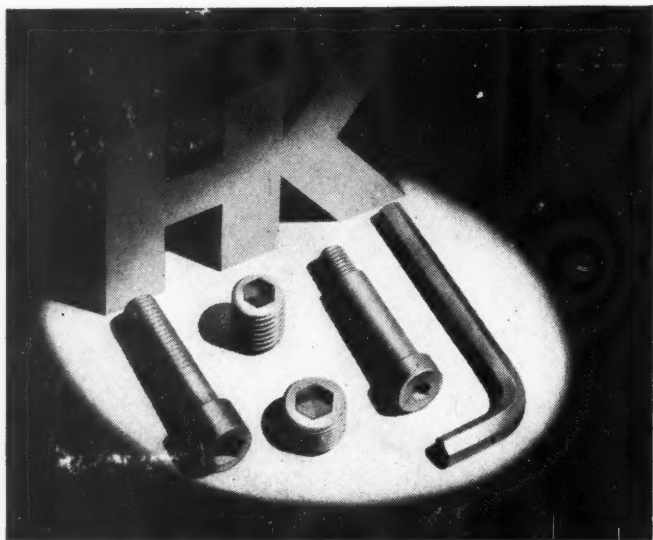
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